

AERIAL SURVEYING EQUIPMENT  
GROUND SUPPORT EQUIPMENT, PROPOSAL

5 October 1955

Part I General Discussion

Part II Description and Illustrations of Specific Items

Part III Contract Change Proposal

Part IV Equipment Specifications

## AERIAL SURVEYING EQUIPMENT GROUND SUPPORT EQUIPMENT, PROPOSAL

5 October 1955

### **PART I General Discussion**

#### **2. Test and Repair Equipment, Mechanical and Electrical**

To insure accuracy and reliability of configuration operation in flight, a ground support complement of test and repair equipment will be available.

Complete configurations and individual major components required to be serviced and tested will include cameras, magazines, cassettes, shutters, programmers, IMC units, mini-vib, stabilized and rocking mounts. For servicing each major component, specialized test units will be necessary with which the correct performance and operational reliability can be determined. A set of general and specialized hand tools will be required to enable disassembly, repair, reassembly and test of each component. Where suitable, functional recording equipment will be utilized for evaluating system or component operation. For testing cameras there will be a test stand bench and specialized support fixtures with external power means which will provide for complete evaluations and optical alignment and collimating equipment for evaluating optical systems. To insure accuracy and reliability of configuration operation in flight, a ground support complement of test and repair equipment must be available. For checking moving parts, motors, gear trains, etc., a strobotach and/or hand tachometer will be required as well as simple torque measuring devices. For testing magazines and cassettes, a cycling stand will provide drive power and measurement of torque requirements. A shutter speed tester will be required to measure shutter performance. The programmer units will be tested with a simplified system simulating actual configuration characteristics. A multi-channel recorder will provide a means of measuring and a record of timing and sequence of events originating from the programmer. Angular rate and acceleration detecting devices will measure the accuracy of the IMC units and mounts. For testing of the mini-vib equipment, an analyzer and a small single axis agitating stand will determine correct operational performance.

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### PART I. General Discussion

will be transported by the equipment transport dolly. The hoist and sling provided by the aircraft manufacturer will be required to raise the configuration into position in the aircraft.

Major cleaning of optics will be performed only within the optical darkroom where the air is conditioned and temperature controlled. Some optical cleaning will be required on the flight line. This would include cleaning of front lens elements, filters, and aircraft camera windows. A dust proof shelter is required for this operation where hangars are unavailable. Handling and shipping of optical components will be accomplished with greatest regard to adequate packaging thus insuring against both mechanical and temperature shock. Flight line optical cleaning is one of the most important functions of preflight operation and one which will present difficult problems in providing adequate shelter against dust and adverse weather conditions.

For ground support operations, the customer will provide an air-conditioned, dust controlled service building, complete with overhead lighting, power outlets (115 V 60 cycles), tap water, and compressed air. For flight line installation, the air frame manufacturer will provide the AC (115 V 60 cycle) and DC (28 volt) power and an overhead hoist and crane. The camera manufacturer shall be required to furnish all other power necessary for test and repair equipment.

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### PART I General Discussion

1. The circumstances of the contemplated operations require that there be maximum assurance of the proper operation of the installed camera equipment. To this end adequate though minimum ground support equipment is required so that through proper installation, test, maintenance and service procedures, the photo service team can provide installed equipment of maximum reliability. The equipment covers those items deemed vital to the success of the over-all operations and will operate remote from factory support and will be largely self-sufficient.

Configurations will be maintained under continuing standby conditions awaiting scheduling. When a mission is posted, the selected configuration will be preflighted by the Photo Service Team and the equipment readied for transport in the shipping container. The configuration cases will be transported on standard flat bed dollies. The magazines or cassettes required for any particular configuration will be loaded in the darkroom and placed into the transit case. The above flat bed dollies will also be used for transporting the magazine transit cases. Specific configuration installation equipment will be contained in the configuration shipping cases. General installation equipment will be carried with the flight line installation equipment. This special equipment dolly will also house a preflight test bench, an electrical test set, auxiliary lighting fixtures and any other items required for readying the photographic system for an operational mission.

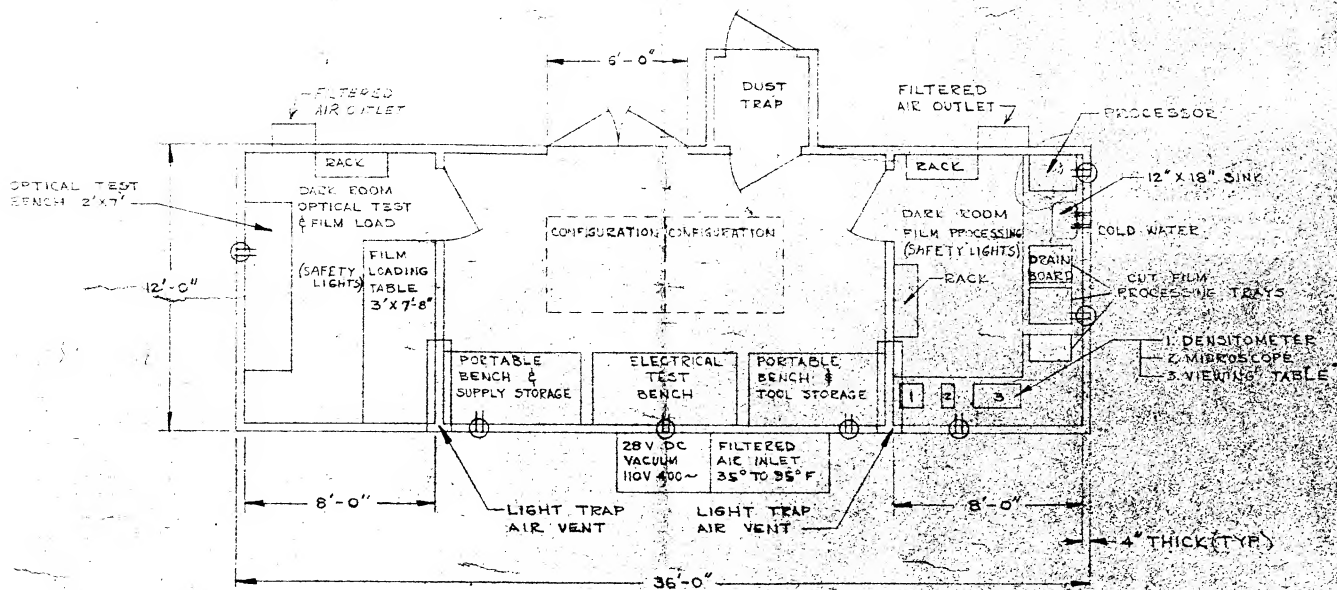
The items required for flight line installation and checkout will be held to an absolute minimum to reduce bulk and weight, however, they will be adequate to accomplish installation and checkout in a reliable and expedient manner to minimize turn around time. For simple emergency repair at a temporary base, the tote box benches containing small hand tools, hardware and some spares can be readily transported to a temporary location.

Exposed film from a test mission will be processed in the service building darkroom utilizing controlled developing methods for obtaining resolution data of the particular configuration flown. To attain high resolution development, special precautions will be required. It is also required that a continuous method of processing be utilized for roll films to insure uniform development. Evaluation of sample test film will include checking for resolution, gamma, evenness of density, image motion, vibration, abrasions or scratches, metering, adequate vacuum, film fog, light leaks, and static exposure.

To enable an all weather capability for installation of configurations where a hangar would be unavailable, a dust and waterproof shelter must be provided to partially cover the nose section of the aircraft. The shelter



GROUND SUPPORT OPERATIONS  
SECTION 2 SERVICE BUILDING, MAIN BASE  
SPACE UTILIZATION PLAN



⊕ DENOTES 115V. 60~ OUTLET. (NORMAL LOAD)

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**PART II Description and Illustrations of Specific Items**

The following numbers reference previously established contract item numbers:

**5.1 Test and Repair Equipment, Mechanical and Electrical**

- 5.1.1 Camera Test Fixtures
- 5.1.2 Magazines and Cassette Test Stands
- 5.1.3 Shutter Test Set
- 5.1.4 Electrical Test Set (Formerly called Programmer Test Set)
- 5.1.5 IMC Test Accessories
- 5.1.6 Mini-Vib Test Set
- 5.1.7 Mount Camera 73-C (Deferred)
- 5.1.8 Rocking Mount (Deleted)
- 5.1.9 General Test and Repair Equipment
- 5.1.10 Test Bench
- 5.1.11 Battery and Vacuum Cart

**5.2 Storage and Care of Photo Supplies**

- 5.2.1 Film Transit Case, Insulated (Deleted)
- 5.2.2 Loaded Magazine and Cassette Transit Case

**5.3 Development and Treatment of Sample Data**

- 5.3.1 Darkroom and Controlled Processing Equipment
- 5.3.2 Evaluation Equipment

**5.4 Storage Racks and Cabinets for Shop**

**5.5 Configuration Installation and Preflight Checkout Equipment**

- 5.5.1 Preflight Checkout Facilities
- 5.5.2 Flight Line Installation Equipment, Slings, Jigs, Alignment Blocks, etc.
- 5.5.3 Standard Transport Dolly
- 5.5.4 Equipment Transport Dollies (deferred)
- 5.5.5 Shelter, Flight Line Installation (Pending)

## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **PART II**

#### **5.1.1 Camera Test Fixtures**

##### **Camera and Film Drive Test Stands**

A critical area of camera maintenance lies in the correct adjustment of the film drive and operation of the vacuum system. This is particularly true of the "73-B" and "73-C" cameras which have complex film drive units.

Accordingly, it is proposed that a film drive test stand be provided for both the 73-B and for the 73-C cameras. These stands will be capable of operating the film drive for observation and adjustment of film tension and timing, vacuum timing, supply and take-up spool action, mode change operations and other camera functions.

The unit will be of simple sturdy portable light weight construction. Every effort will be made to keep production and engineering costs to a minimum.

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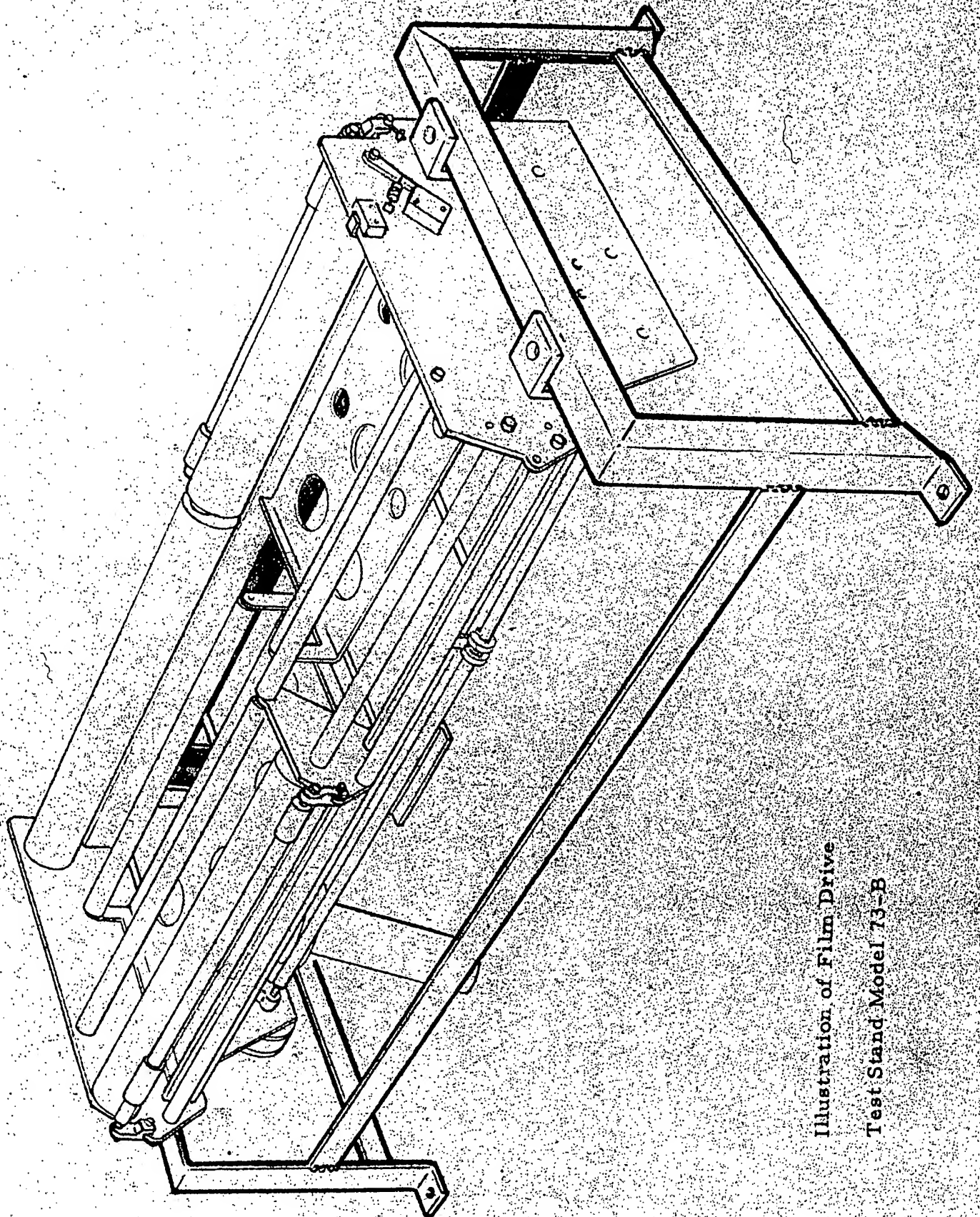


Illustration of Film Drive

Test Stand Model 73-B



## AERIAL SURVEYING EQUIPMENT GROUND SUPPORT EQUIPMENT, PROPOSAL

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### Part II General Description and Illustrations of Specific Items

#### 5.1.2 Magazine and Cassette Test Stands

Field experience in photographic programs has indicated that magazine and cassette problems are frequently the source of camera malfunctions. It is therefore proposed that test stands be provided which will permit full operational test and calibration of the magazines and cassettes prior to each mission, or, as operational experience dictates, at regular field maintenance periods.

Consideration has been given to fabricating one test set to handle all configurations, however, due to weight, size, complexity and cost problems, it is deemed advisable to produce four units; one for each of the following: HM-730 Magazine, HM-731 Magazine, Cassettes for the 73-B Camera, and Cassettes for the 73-C Camera.

It is planned that the test stands will be of aluminum structure and will provide outputs simulating camera case drive torque. Torque measurement will be made with a hand torque indicator with a range adequate for the magazine or cassette to be tested. Provision will be made to operate the HC-730 and HC-731 test stands in conjunction with the separately provided vacuum and power supplies, provided from the Battery and Vacuum Cart. Mounting of the magazines or cassettes to the test stand will utilize the same clamping means as provided on the camera. The stand for the HM-730 and HM-731 will utilize HC-730 and HC-731 Camera Case Drives to cycle the magazine. For the 73-B and 73-C a hand crank will be provided to cycle the film through the cassettes. For all stands dummy film rolls with a 50' length of Mylar film will be used to simulate actual film loads, without the expense of live film.

Design will be directed toward providing a bench type, simple, light weight and yet rugged equipment capable of providing adequate testing under operational conditions.

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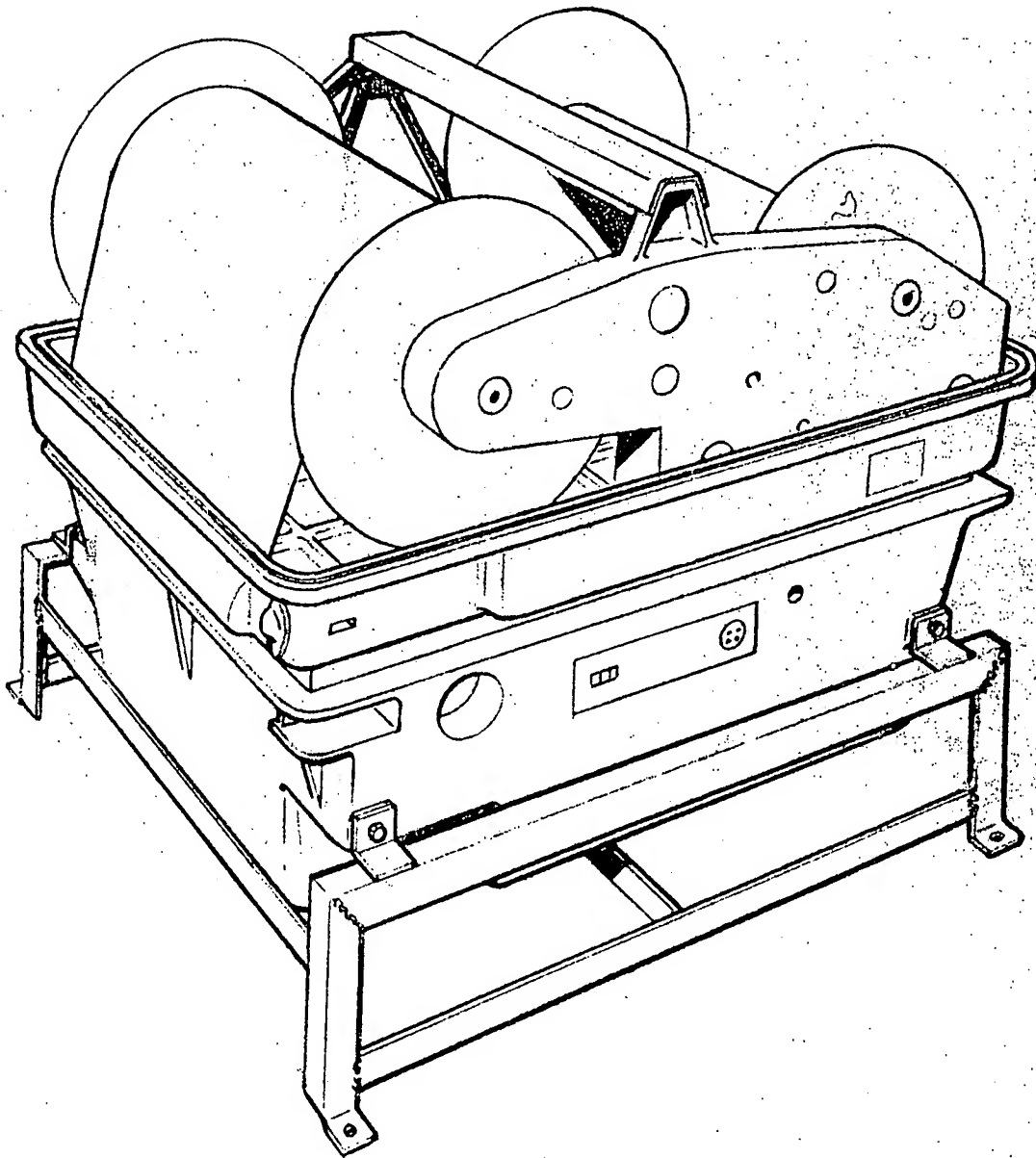


Illustration of Magazine Test Stand for Magazine

Model EM-731



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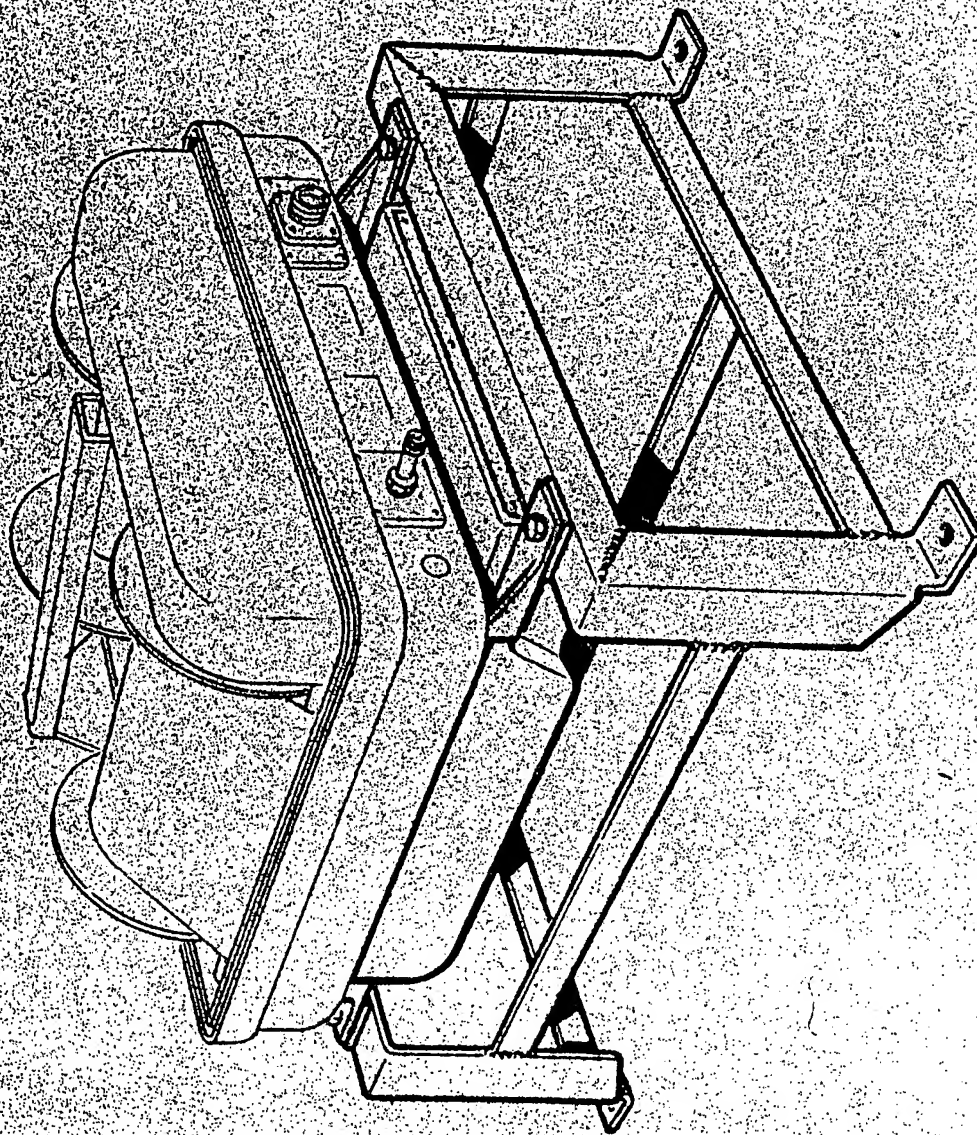


Illustration of Magazine Test Stand for Magazine Model HM-730

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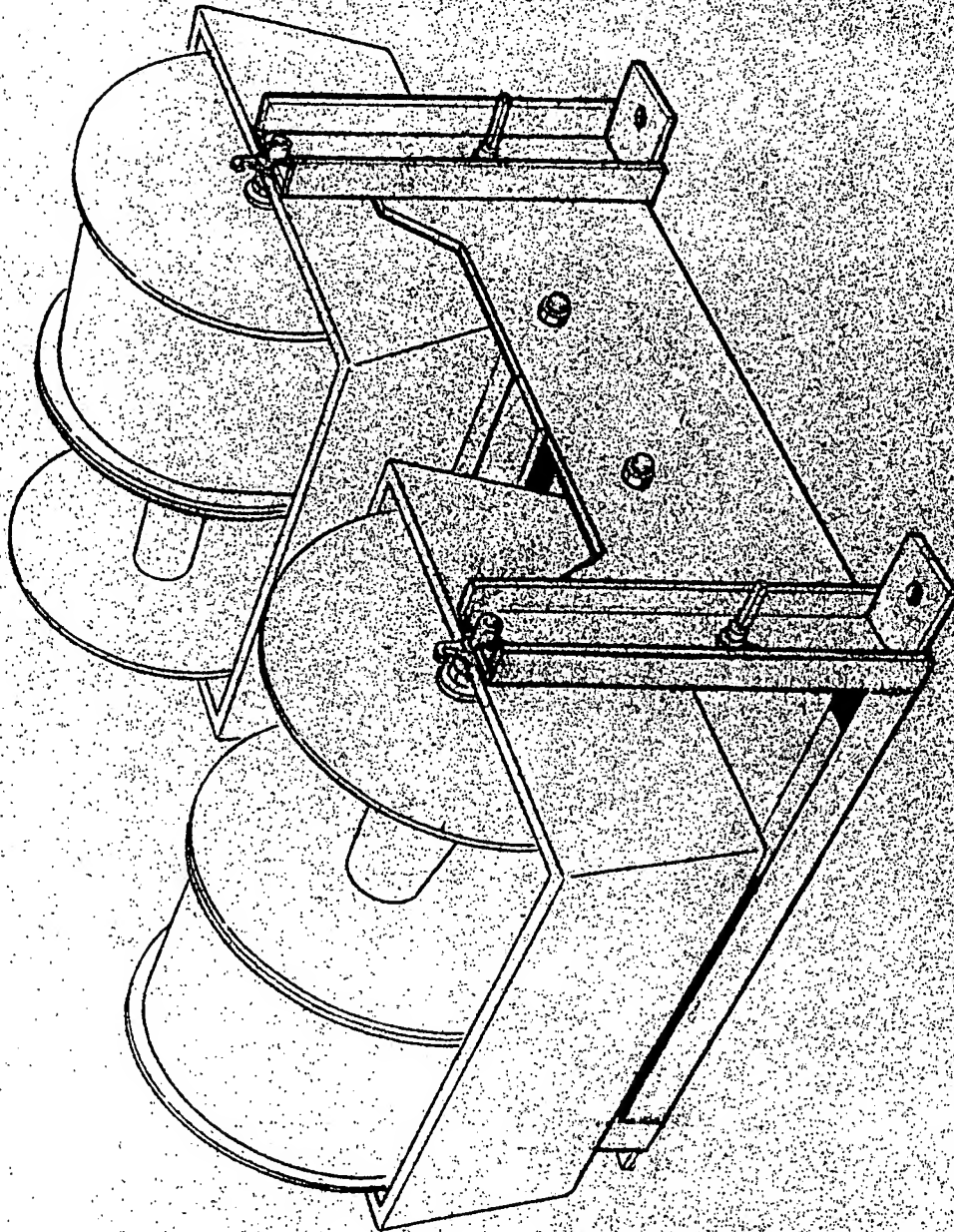


Illustration of Cassette Test Stand Model 73-B

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Part II General Description and Illustrations of Specific Items

5.1.3 Shutter Test Set

Optimum photographic results can be best achieved by maintaining as accurate and repeatable shutter actions as possible. To this end it is necessary to provide a shutter test unit which is capable of evaluating both the intra-lens and focal plane shutters, and presenting the results of the evaluation in such a manner that it can be readily interpreted by skilled personnel.

The shutter tester will consist of a standard 5" oscilloscope (which will be utilized in conjunction with other test units), a oscillo-record camera, a light source, a photo cell, cables, and shutter/camera adapters. Photographs of the oscilloscope trace can be interpreted as follows:

For intra-lens shutters:

- a. Elapsed time between initiation of opening and completion of closure.
- b. Shutter efficiency.
- c. Elapsed time between electrical shutter command and initiation of opening.

For focal plane shutters:

- a. Elapsed time between initiation and completion of slit travel.
- b. Slit width vs traverse position.
- c. Elapsed time between electrical shutter command and initiation of slit travel.
- d. Traverse position vs time.

A means will be provided for handling the shutters mounted in cameras and/or cones. Shutter operation will be initiated through the normal camera-shutter circuitry. Power for the camera will be provided through the associated Electrical Test Panel and the Battery Power Cart.

The design approach will be to provide a simple light weight and rugged equipment suitable for performing the maintenance and calibration required. Every effort will be made to utilize standard components such as in the case of the oscilloscope and scope camera in order to keep engineering and production costs to a minimum.

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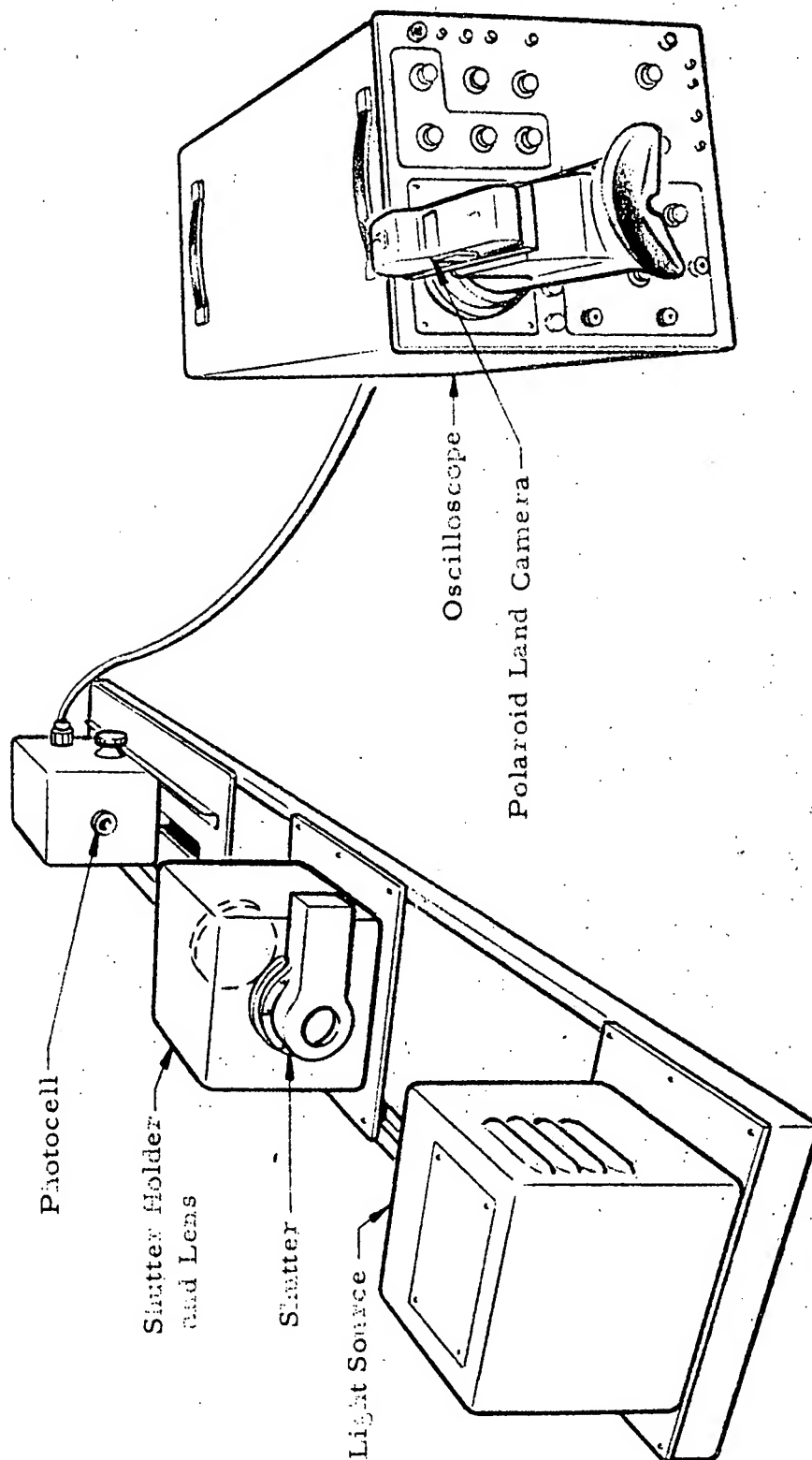


Illustration of Shutter Test Set

Additional adapters will be provided for Mounting HS-731, HS-73  
and HS-73 C (Focal Plane)



## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **GROUND SUPPORT EQUIPMENT - PART II**

#### **5.1.4 Electrical Test Set**

##### **Requirement**

In order to consistently achieve the photo results desired on this program it is necessary to establish and maintain a comprehensive and complete electrical test and calibration of all electrical components of the system.

An electrical test set is therefore proposed which will be useful as a Preflight unit, as well as in base operation. The equipment provided will be portable and as small as possible (see illustration) and will serve as both a "test junction box" and a simple Go-No-Go monitoring device. Tests performed and results obtained will thus be on a systematic basis.

Specific assemblies to be tested by the Electrical Test Set are as follows:

- a. Complete Configuration
- b. Camera Film Drive
- c. Complete Camera
- d. Magazine
- e. Shutter
- f. Camera Body
- g. Programmer
- h. Servo-System
- i. Rocking Mount
- j. Stabilized Mount
- k. Image Motion Compensation
- l. Power Junction Box

28V power will be provided by the battery and vacuum cart. During Preflight the 110V, 60 cycle power will be obtained from the "External Power Source" provided by the Air Frame manufacturer. During shop operation the base power will be used.

Design emphasis will be placed on providing a light weight checkout test set which will be adequate to test all critical component circuitry.

## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **GROUND SUPPORT EQUIPMENT - PART II**

#### **5.1.4 Electrical Test Set, Cont'd.**

The equipment will be planned to operate in conjunction with other test equipment such as the magazine test stand, camera test fixture, shutter test set, etc. Engineering emphasis will be directed towards providing as simple, and therefore as inexpensive, equipment as possible.



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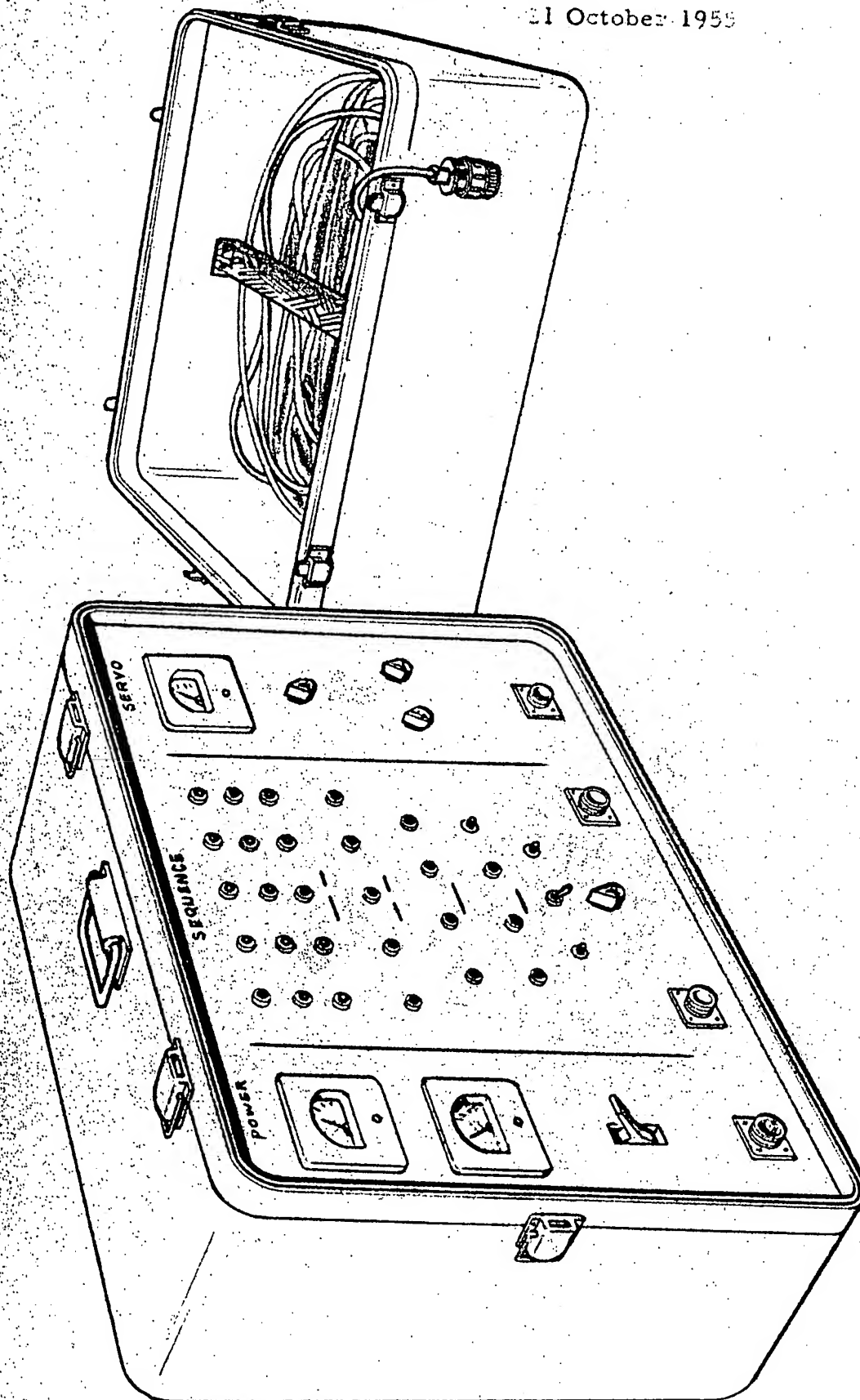


Illustration of Electrical Test Set

AERIAL SURVEYING EQUIPMENT  
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PART II

5.1.5 IMC TEST ACCESSORIES

Image motion compensation has been provided in all configurations in order to minimize the effect of aircraft forward speed on photographic resolution. Correct operation of IMC thus vitally affects photographic results.

It is therefore proposed that test equipment be provided which determines that IMC drives are operating within design specifications.

It is planned that the IMC test equipment will be operated in conjunction with the Electrical Test Set, the test bench and the Battery Power Cart. IMC on Configurations "A" and "B" will be measured by means of a transducer mounted on the configuration which will produce an electrical output proportional to either position or velocity. This will be displayed on the Oscillograph Recorder provided with the General Test and Repair Equipment.

Configuration "C" utilizes a servo controlled IMC system, and therefore will be tested in a different manner. Command signals will be fed into the IMC Servo Amplifier by means of a manual step switch. A transducer mounted on the mirror will be used to measure IMC rate. The output of the transducer will be displayed on the recorder. In addition, the error voltage from the Servo Amplifier will be observed for calibration purposes by use of a VTVM or the recorder supplied as part of General Test and Repair Equipment.

## AERIAL SURVEYING EQUIPMENT GROUND SUPPORT EQUIPMENT, PROPOSAL

### PART II

#### 5.1.6 MINI-VIB TEST SET

Photographic resolution is frequently adversely affected by vibration of the camera at the time the picture is taken. The purpose of the MINI-VIB unit is to select a period of minimum vibration for shutter operation, thus optimizing expected photographic results. Correct operation of the Mini-Vib through each mission will thus result in photography of an average higher order of resolution. Correct operation can best be maintained by means of a suitable test equipment. It is therefore proposed that a Mini-Vib Test Unit be provided which will test the Mini-Vib under simulated operational conditions. The tests performed will determine if the Mini-Vib produces a shutter pulse for vibrations smaller than the selected level, and that it will not produce a shutter pulse when the vibrations are in excess of the desired level.

In order to determine operation, the Mini-Vib will be placed on a small single axis oscillating table which is capable of producing calibrated oscillations which may be varied approximately plus or minus 20% around the required threshold level. A standard intervalometer will be utilized to provide simulated shutter pulses. The oscillograph recorder from the electrical test set will be used to record input pulse and output pulse, and also record the oscillating table motion for correlation with the pulses.

The design approach will be to utilize a simplified shake table with the necessary adaptors and associated signal recording devices. Light weight portable construction will be utilized whenever possible.

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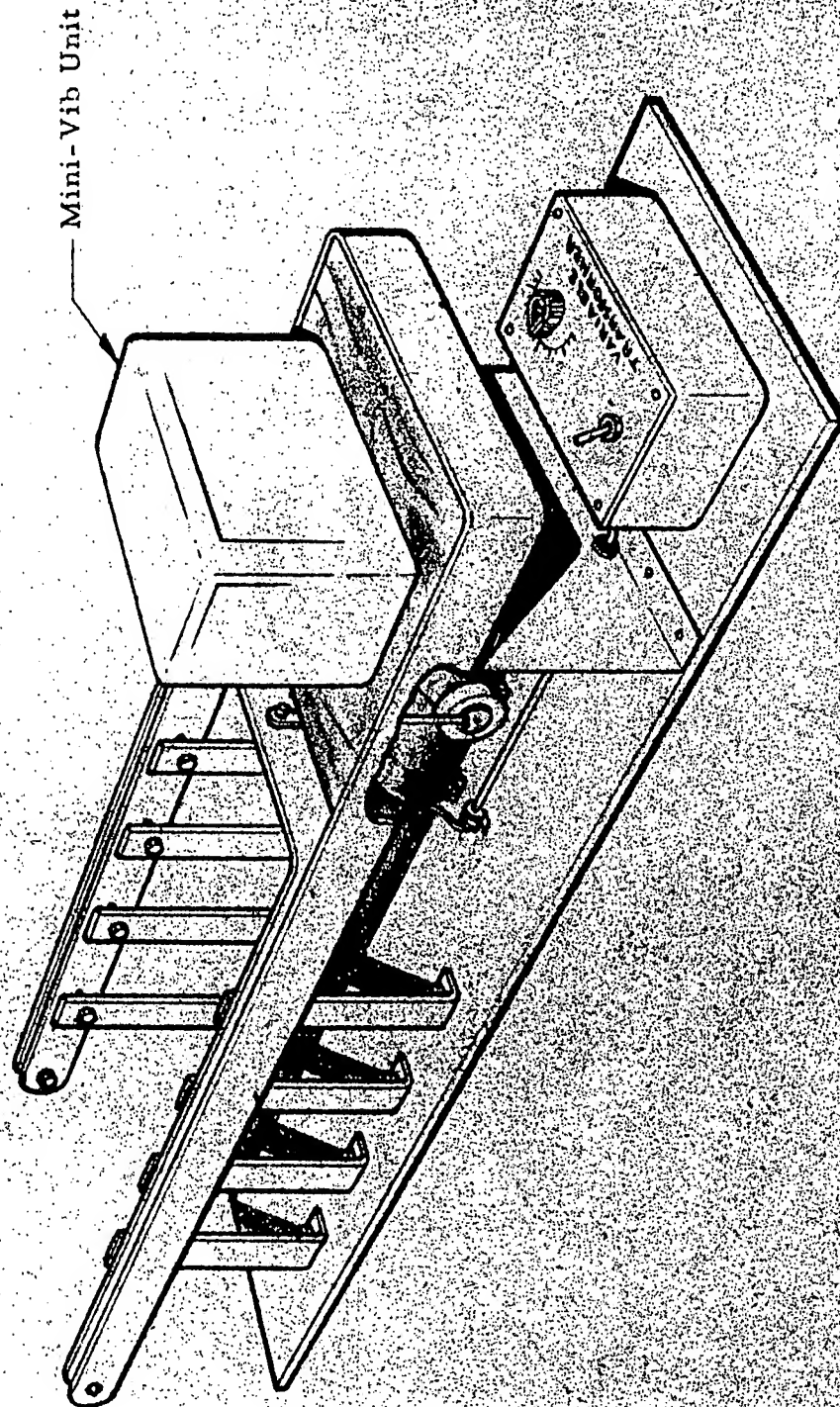


Illustration of Oscillating Table for Mini-Vib Testing



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**GROUND SUPPORT EQUIPMENT - PART II**

**5.1.9 General Test, Repair and Supply Equipment**

The Field Service Teams are responsible for the field maintenance on operation of all configurations under operational as well as training conditions. Kits of general purpose tools are to be provided each member of the field teams. In addition, a set of special purpose tools are to be provided for each base of operation.

Part IV, Section 5.1.9.1 and 5.1.9.2 contain a list of tools representative of those to be provided.

In addition to the tools to be provided it is also necessary to furnish an initial stock of supplies. Part IV, Section 5.1.9.3 contains a representative list of the various supplies required.

A tote box bench is illustrated on the following page. This bench will serve as storage for service tools and supplies, both during transportation and in actual use. The box itself will become a work bench when set up either on the flight line or in the shop.

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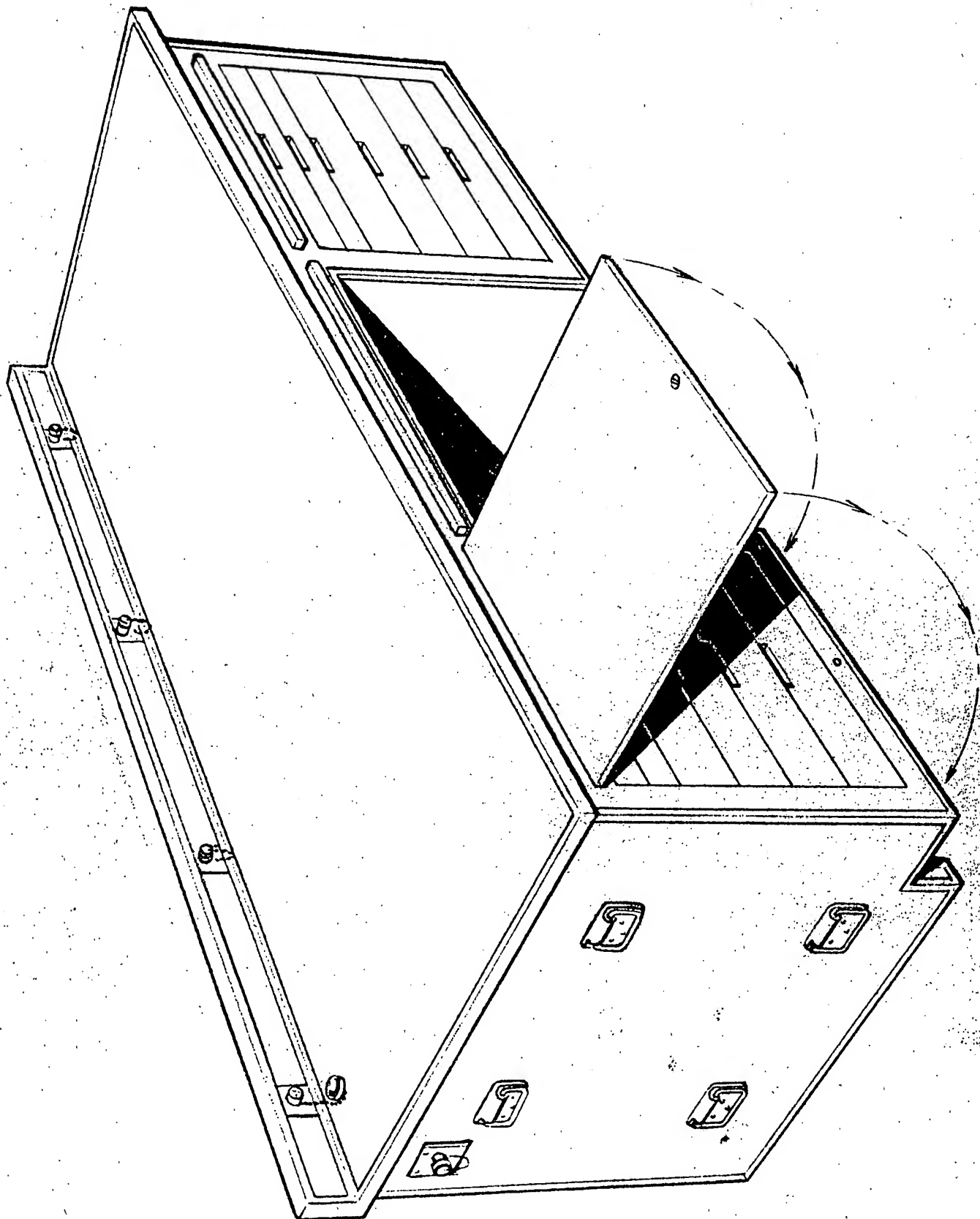


Illustration of Tote Box Bench



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### **PART II**

#### **GROUND SUPPORT EQUIPMENT**

##### **5.1.10 Test Bench**

In order to perform maintenance and repair of camera equipment on an orderly basis, a means is required to support cameras and associated test fixtures. Following is an illustration of the Test Bench proposed. It should be noted that a "well" is provided for adequately supporting the camera during test. Stowage of test fixtures is contained in the bench.

Light weight structure (plywood and aluminum) will be utilized to facilitate transportation and ground handling as well as to keep costs at a minimum.

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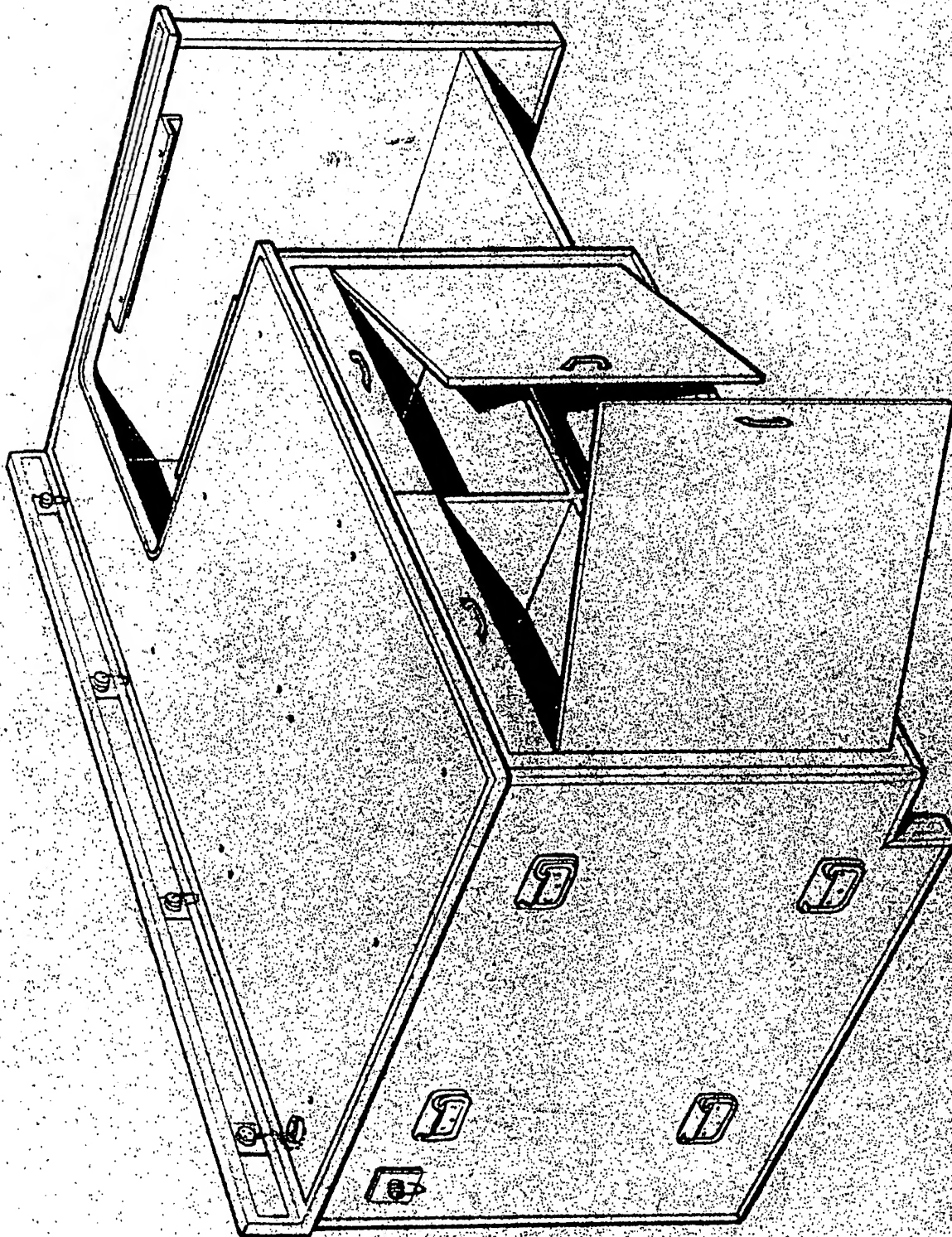


Illustration of Test Bench

## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **PART II**

#### **GROUND SUPPORT EQUIPMENT**

##### **5.1.11 Battery and Vacuum Cart**

All cameras provided on the program operate with 28V DC power and all require nominal 5" Hg vacuum. Cameras will be operated on the flight line and in the shop area.

A portable power and vacuum cart is proposed (see illustration) which will be capable of providing 28V DC for camera operation. Vacuum will be obtained through the use of a vacuum pump and tank operating on 110V AC power. The 110V AC power access on the flight line will be through the power source provided by the Air Frame Manufacturer. Major utilization of this equipment will be in the shop area in performing routine maintenance and test.

In the interest of low cost and light weight a standard 110V vacuum pump has been selected. Batteries will be standard heavy duty, storage type which can be recharged at the base. A wheeled aluminum frame will be provided to facilitate transportation and handling.

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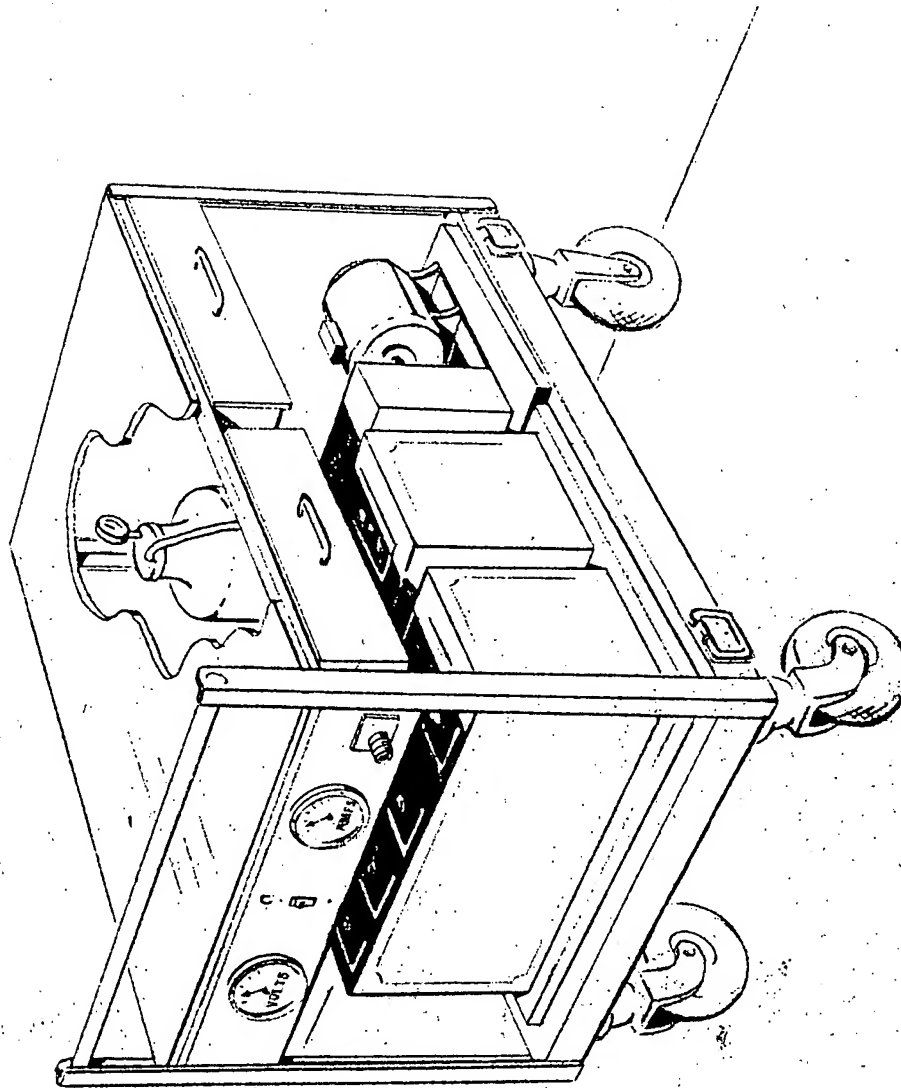


Illustration of Battery and Vacuum Cart



## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **PART II**

#### **GROUND SUPPORT EQUIPMENT**

##### **5.2.2 Loaded Magazine and Cassette Transit Case**

Protection from dust and excess environmental conditions must be afforded loaded magazines and cassettes during transportation and for short term storage at operational bases. In addition, such protection is desirable for returning the film to the service area on completion of a mission.

A loaded magazine and cassette transit case is proposed which is capable of carrying a complete complement of magazines or cassettes of any configuration.

Construction will be of sheet aluminum and will have approximately two inches of insulating material in order to maintain temperature over a 48 hour period. Handles are provided for ease of handling. A relief valve will be installed to prevent damage due to pressure changes in transportation.

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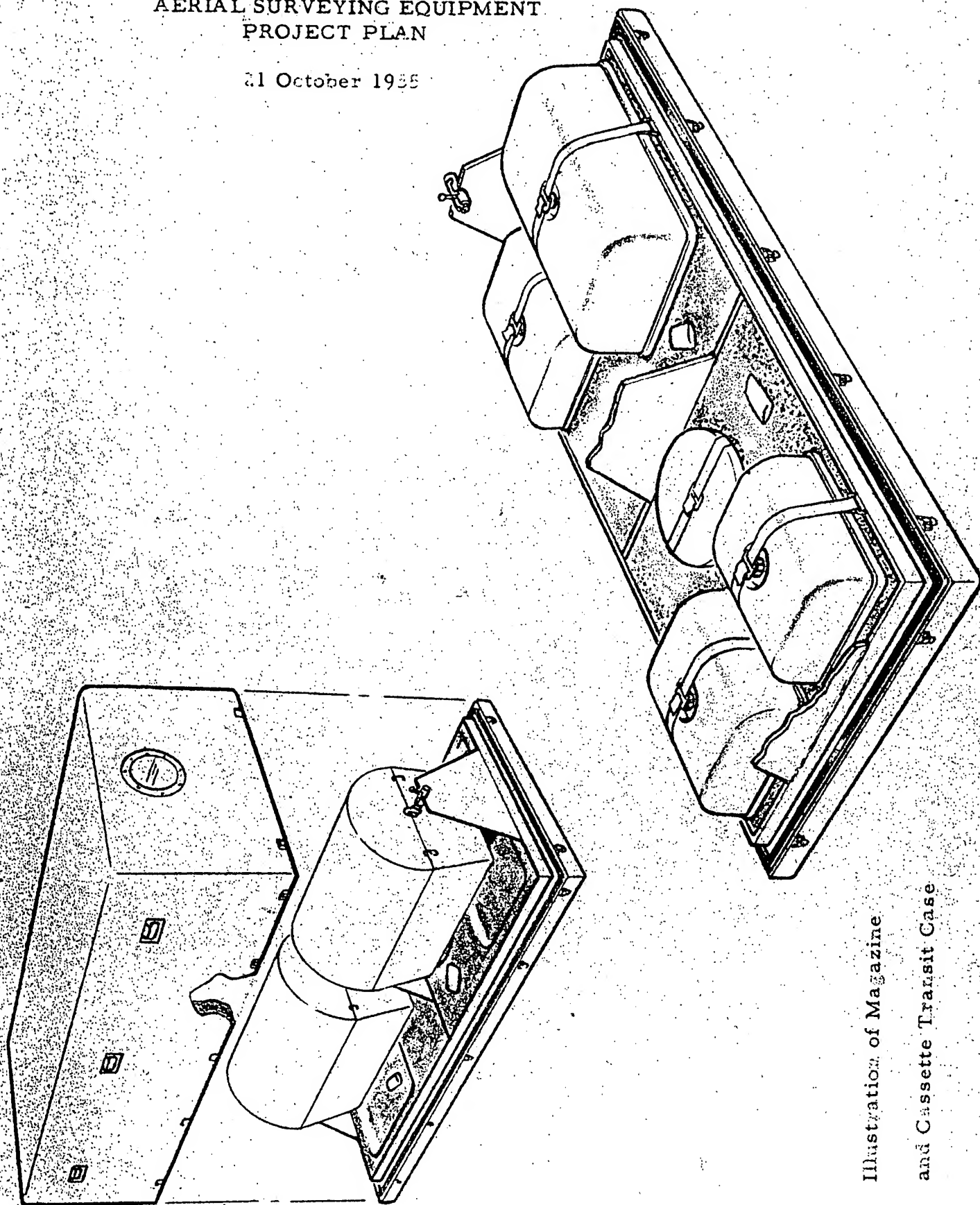


Illustration of Magazine  
and Cassette Transit Case



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### PART II

#### GROUND SUPPORT EQUIPMENT

##### 5.3 Development and Treatment of Sample Data

During the course of camera checkout it will frequently be required that pictures be taken and results assessed. Adequate processing facilities are therefore required.

## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **PART II**

#### **GROUND SUPPORT EQUIPMENT**

##### **5.3.1 Darkroom and Controlled Processing Equipment**

Processing of sample data to assure optimum functioning of photo equipment at the operating bases is mandatory. The camera manufacturer will provide facilities and equipment to process the sample data. Part IV, Paragraph 5.3.1, Parts List, is representative of the equipment required. It is understood that the film manufacturer will provide the 70mm processing equipment for field use.

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**PART II**

**GROUND SUPPORT EQUIPMENT**

**5.4 Storage Racks & Cabinets for Shop**

On the following page is an illustration of the maintenance shop floor plan. Minimum facilities for storage racks, work tables and cabinets will be provided by the camera manufacturer. Part IV, Section 5.4, is representative of the items to be supplied.



## **AERIAL SURVEYING EQUIPMENT PROJECT PLAN**

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### **PART II**

#### **GROUND SUPPORT EQUIPMENT**

##### **5.5 Configuration Installation and PreFlight Checkout Facilities**

In view of the size and complexity of the photographic components to be supplied, it is necessary to provide means to install the configuration in the aircraft. A work and storage facility for the basic test equipment must be provided.

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### PART II

#### GROUND SUPPORT EQUIPMENT

##### 5.5.1 Preflight Checkout Equipment

During preflight operations under field conditions it is necessary to provide facilities for electrical and mechanical checkout of the configurations. Elsewhere in this proposal a number of specialized test equipments have been proposed which will be extremely utilized in preflight. In order to insure orderly and therefore systematic checkout it is advisable to provide ready access to the test equipment with a small, compact work facility, incorporating a 115V 60 cycle service panel.

During preflight the various required items of test equipment will be operated from the test stand. The "External Power Source" provided by the Air Frame Manufacturer will be connected to the service panel.

Light weight aluminum frame and plywood construction will be utilized. Handling facilities for transportation will be provided. Engineering and construction costs will be minimized by the use of standard components and hardware.



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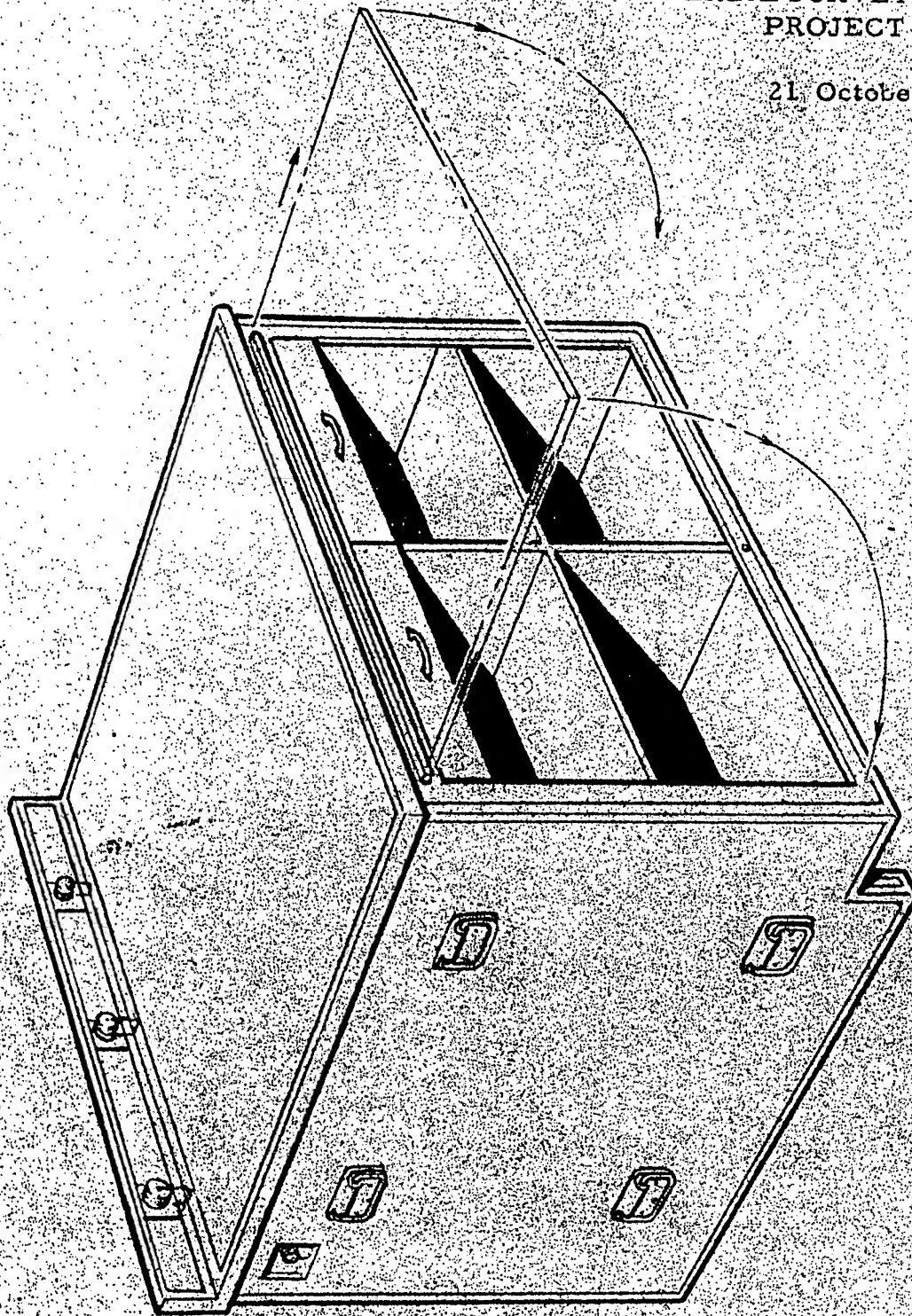


Illustration of Preflight Check out Bench

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5.3.2 Flightline Installation Equipment

The flightline installation and checkout equipment as follows while held to an absolute minimum in size, weight and numbers will provide the photo service team reliable and expedient facilities to the end of maximum assurance of the proper operation of the installed camera equipment:

- Standard Transport Dolly
- Preflight Test Stand
  - Electrical Test Set
  - Tool Box
  - Oscillograph Recorder
  - Event Recorder
- Collimator
- Magazine Transit Case
- Configuration in Shipping Container
- Battery and Vacuum Cart (Optional)
- Shelter (Pending)

Requirements of slings, jigs, alignment blocks, etc. as aids in the installation procedures will be held to an absolute minimum. The current test site operations will determine the facilities required for the projected operational program and studies are presently being made by the camera manufacturer toward this end.

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#### 5.5.3 Standard Transport Dolly

For the purpose of providing a ready means of transport of Configurations and associated equipment, it is proposed that a simple light weight standard transport dolly be utilized. This equipment will be particularly useful under operational conditions in unimproved or graded areas. Ample clearance is provided for handling equipment over rough terrain.

An essentially standard aluminum dolly has been selected which lends itself easily to air transport and to handling by man power as well as by motive power. The high bottom clearance and large diameter wide tread wheels will considerably ease handling problems in unimproved areas.

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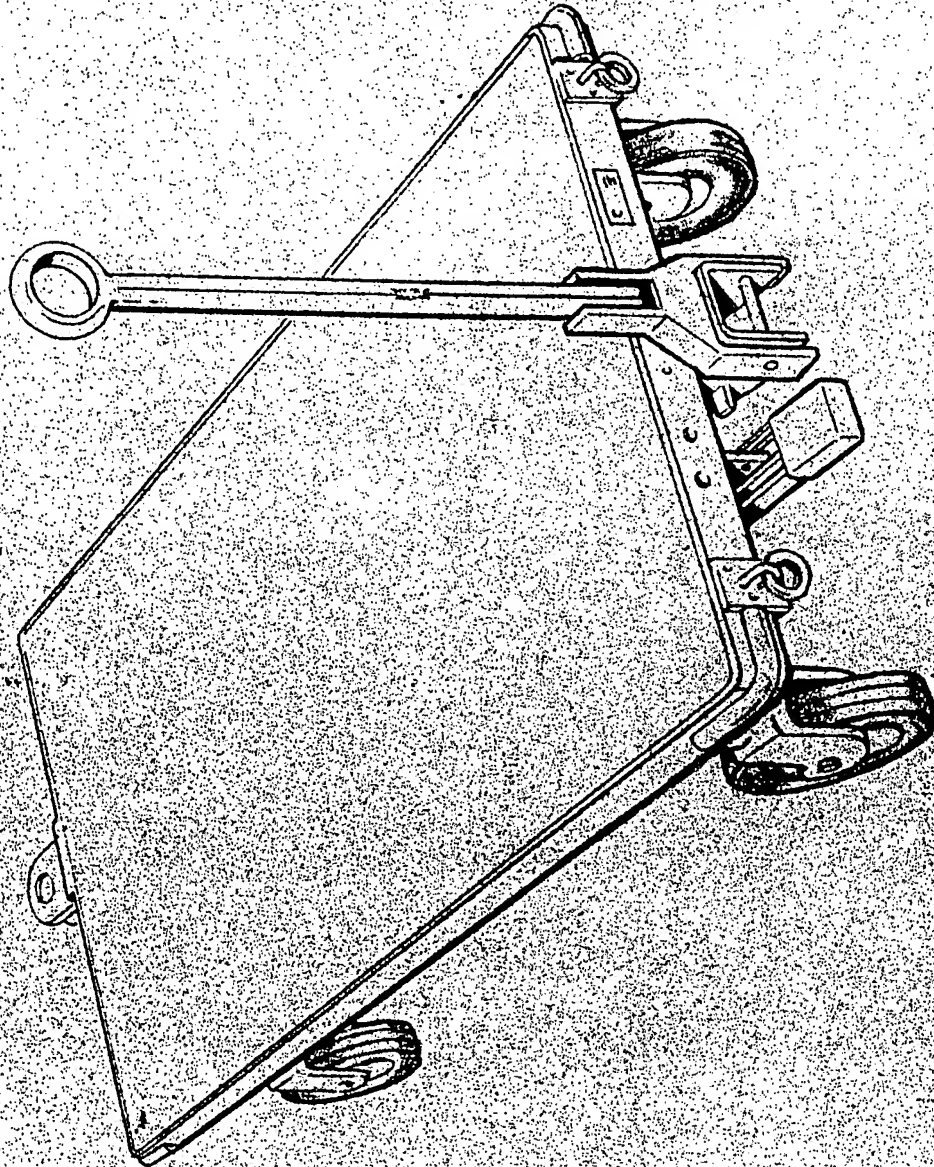


Illustration of Standard Transport Dolly

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**GROUND SUPPORT EQUIPMENT - PART II**

**5.5.4 Equipment Transport Dolly**

**Deferred**



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**5.5.5 Shelter**

**Separate proposal in preparation.**

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**Part III Contract Change Proposal**

| Item No. | Hycon Code | Description  | Unit Price | Total Price |
|----------|------------|--|------------|-------------|
| 185      | 5.1.1      | Design Phase I, Camera Test Fixtures<br>Delivery - 10 January 1956   |            | 1,100.      |
| 186      | 5.1.1      | Deliver three (3) sets of Camera 73-B Test Fixtures<br>Delivery - One (1) 31 January 1956<br>Two (2) 28 February 1956  | 120.       | 370.        |
| 187      | 5.1.1      | Deliver three (3) production sets of Camera 73-C Test Fixtures<br>Delivery - Three (3) 31 March 1956   | 183.       | 549.        |
| 188      | 5.1.2      | Design Phase I of Magazine and Cassette Test Stands<br>Delivery - 31 January 1956  |            | 3,100.      |
| 189      | 5.1.2      | Deliver three (3) sets of Magazine Test Stands (incl. dummy film spools) for Configuration "A"<br>Delivery - Three (3) 31 January 1956   | 900.       | 2,700.      |
| 190      | 5.1.2      | Deliver three (3) sets of Cassette Test Stands (incl. dummy film spools) for Configuration 73-B & 73-C each.<br>Delivery - Three (3) each 73-B - 28 February 1956<br>Three (3) each 73-C - 30 April 1956 | 840.       | 2,520.      |
| 191      | 5.1.3      | Design Phase I of Shutter Test Set<br>Delivery - 10 January 1956   |            | 2,400.      |
| 192      | 5.1.3      | Deliver first article of one (1) Shutter Test Set<br>Delivery - 28 February 1956   |            | 1,600.      |
| 193      | 5.1.3      | Deliver two (2) production units of Shutter Test Set<br>Delivery - Two (2) 30 April 1956   | 2,100.     | 4,200.      |

| Item No. | Hycon Code | Description   | Unit Price | Total Price |
|----------|------------|---|------------|-------------|
| 194      | 5.1.4      | Design Phase I of Electrical Test Set<br>Delivery - 31 December 1955  |            | 4,600.      |
| 195      | 5.1.4      | Deliver first article of one (1) unit of<br>Electrical Test Set<br>Delivery - 15 February 1956  |            | 3,330.      |
| 196      | 5.1.4      | Deliver five (5) production units of<br>Electrical Test Set<br>Delivery - One (1) 28 February 1956<br>Two (2) 31 March 1956<br>Two (2) 30 April 1956            | 2,750.     | 13,730.     |
| 197      | 5.1.5      | Design Phase I of IMC Test Accessories<br>for Configuration A & B. (note:<br>Accessories for "C" included in item<br>203, 5.1.7)<br>Delivery - 31 December 1955 |            | 750.        |
| 198      | 5.1.5      | Deliver first article of one (1) set of<br>IMC Test Accessories for Configurations<br>A and B<br>Delivery - 13 February 1956                                    |            | 350.        |
| 199      | 5.1.5      | Deliver two (2) production sets of IMC<br>Test Accessories for Configurations<br>A and B<br>Delivery - Two (2) 31 March 1956                                    | 250.       | 500.        |
| 200      | 5.1.6      | Design Phase I of Mini-Vib Test Set<br>Delivery - 31 November 1955  |            | 2,025.      |
| 201      | 5.1.6      | Deliver first article of one (1) unit of<br>Mini-Vib Test Set<br>Delivery - 31 January 1956   |            | 1,450.      |
| 202      | 5.1.6      | Deliver two (2) production units of<br>Mini-Vib Test Set<br>Delivery - Two (2) 31 March 1956  | 850.       | 1,700.      |



| Item No. | Hycon Code | Description  | Unit Price | Total Price |
|----------|------------|--|------------|-------------|
| 203      | 5.1.7      | Design Phase I of Mount, 73-C<br>Delivery - (Deferred)   |            |             |
| 204      | 5.1.7      | Deliver first article of one (1) unit of Mount, 73-C<br>Delivery - (Deferred)  |            |             |
| 205      | 5.1.7      | Deliver two (2) production units of Mount 73-C<br>Delivery - (Deferred)  |            |             |
| 206      | 5.1.8      | Item Deleted   |            |             |
| 207      | 5.1.8      | Item Deleted   |            |             |
| 208      | 5.1.8      | Item Deleted   |            |             |
| 209      | 5.1.9      | Deliver first article of one (1) set of Test and Repair Equipment, General, including Small Hand Tools, Supplies and two Tote Box Benches<br>Delivery - 38 February 1956 | 12,000.    |             |
| 210      | 5.1.9      | Deliver two (2) production sets of Test and Repair Equipment, General, including Small Hand Tools, Supplies and Two Tote Box Benches<br>Delivery - Two (2) 31 March 1956 | 12,000.    | 24,000.     |
| 211      | 5.1.10     | Design Phase I of Test Bench<br>Delivery - 15 February 1956  |            | 850.        |
| 212      | 5.1.10     | Deliver first article of one (1) unit of Test Bench<br>Delivery - 28 February 1956   |            | 600.        |
| 213      | 5.1.10     | Deliver two (2) production units of Test Bench<br>Delivery - Two (2) 31 March 1956   | 600.       | 1,200.      |



| Item No. | Hycon Code | Description   | Unit Price | Total Price |
|----------|------------|---|------------|-------------|
| 214      | 5.1.11     | Design of Phase I of Battery and Vacuum Cart<br>Delivery - 20 December 1955   |            | 550.        |
| 215      | 5.1.11     | Deliver first article of one (1) unit of Battery and Vacuum Cart<br>Delivery - 15 January 1956  |            | 1,200.      |
| 216      | 5.1.11     | Deliver two (2) production units of Battery and Vacuum Cart<br>Delivery - Two (2) 31 March 1956   | 1,200.     | 2,400.      |
| 217      | 5.2.2      | Deliver first article of one (1) unit of Loaded Magazine and Cassette Transit Case<br>Delivery - 15 February 1956   |            | 4,000.      |
| 218      | 5.2.2      | Deliver eight (8) production units of Loaded Magazine and Cassette Transit Case<br>Delivery - Two (2) 15 February 1956<br>Three (3) 31 March 1956<br>Three (3) 30 April 1956  | 1,100.     | 8,800.      |
| 219      | 5.3.1      | Deliver three (3) production sets of Darkroom and Controlled Processing Equipment(9" roll film processing equipment, customer furnished)<br>Delivery - One (1) 15 February 1956<br>One (1) 31 March 1956<br>One (1) 30 April 1956 | 3,300.     | 9,900.      |
| 220      | 5.3.2      | Deliver three (3) production sets of Evaluation Equipment<br>Delivery - One (1) 15 February 1956<br>One (1) 31 March 1956<br>One (1) 30 April 1956  | 1,500.     | 4,500.      |
| 221      | 5.3.2.1    | Deliver three (3) production units of 70mm Projection Viewer<br>Proposal Pending  |            |             |

| Item No. | Hycon Code | Description  | Unit Price | Total Price                        |
|----------|------------|--|------------|------------------------------------|
| 222      | 5.4        | Deliver three (3) production sets of Storage Racks and Cabinets for Shop   | 750.       | 2,250.                             |
|          |            | Delivery - One (1) 15 February 1956<br>One (1) 31 March 1956<br>One (1) 30 April 1956                                      |            |                                    |
| 223      | 5.5.1      | Design of Phase I of Preflight Check-out Facilities  |            | 800.                               |
|          |            | Delivery - 31 January 1956   |            |                                    |
| 224      | 5.5.1      | Deliver first article of one (1) set of Preflight Checkout Facilities  |            | 550.                               |
|          |            | Delivery - 15 February 1956  |            |                                    |
| 225      | 5.5.1      | Deliver two (2) production sets of Preflight Checkout Facilities   | 450.       | <del>2,250</del><br><del>900</del> |
|          |            | Delivery - One (1) 31 March 1956<br>One (1) 30 April 1956  |            |                                    |
| 226      | 5.5.2      | Deliver first article of one (1) set of Flight Line Installation Equipment, including Slings, Jigs, Alignment Blocks, etc. |            | 2,500.                             |
|          |            | Delivery - 15 February 1956  |            |                                    |
| 227      | 5.5.2      | Deliver two (2) production sets of Flight Line Installation Equipment, including Slings, Jigs, Alignment Blocks, etc.      | 2,000.     | 4,000.                             |
|          |            | Delivery - One (1) 31 March 1956<br>One (1) 30 April 1956  |            |                                    |
| 228      | 5.5.5      | Design of Phase I, Shelter, Flight Line Installation   |            |                                    |
|          |            | Delivery - (Deferred)  |            |                                    |
| 229      | 5.5.5      | Deliver first article of one (1) set of Shelter, Flight Line Installation  |            |                                    |
|          |            | Delivery - (Deferred)  |            |                                    |

| Item No. | Hycon Code | Description  | Unit Price | Total Price |
|----------|------------|--|------------|-------------|
| 230      | 5.5.5      | Deliver two (2) production sets of Shelter, Flight Line Installation<br><br>Delivery - (Deferred)                                    |            |             |
| 243      | 5.5.3      | Deliver first article of one (1) unit of Standard Transport Dolly<br><br>Delivery - 28 December 1955                                 |            | 500.        |
| 244      | 5.5.3      | Deliver five (5) production units of Standard Transport Dolly<br><br>Delivery - One (1) 28 December 1955<br>Four (4) 31 January 1956 | 500.       | 2,500.      |
| 245      | 5.5.4      | Deliver first article of one (1) unit of Equipment Transport Dolly<br><br>Delivery - (Deferred)                                      |            |             |
| 246      | 5.5.4      | Deliver two (2) production units of Equipment Transport Dolly<br><br>Delivery - (Deferred)   |            |             |
| 247      | 8.5        | System Engineering, Ground Support Equipment, Phase I<br><br>Delivery - 31 November 1955   |            | 15,000.     |
| 248      | 8.5        | System Engineering, Ground Support Equipment, Phase II<br><br>Delivery - 31 November 1955  |            | 5,000.      |
| TOTAL    |            |  |            | 152,225.    |

Test site — 122,700  
 274,925  
 1,350  
 276,275  
 20,413  
 296,688



**AERIAL SURVEYING EQUIPMENT  
GROUND SUPPORT EQUIPMENT, PROPOSAL**

5 October 1955

**PART IV Equipment Specifications**

The equipment specifications are contained in Section 5 of the Project Plan. Section 5 of the Project Plan is enclosed and comprises part IV of the Ground Support Equipment Proposal



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

5 October 1955

### Section 5 Ground Support Equipment

#### 5.1 Test and Repair Equipment, Mechanical and Electrical

- 5.1.1 Camera Test Fixtures
- 5.1.2 Magazines and Cassette Test Stands
- 5.1.3 Shutter Test Set
- 5.1.4 Electrical Test Set (Formerly Programmer)
- 5.1.5 IMC Test Accessories
- 5.1.6 Mini-Vib Test Set
- 5.1.7 Mount, Camera 73-C
- 5.1.8 Rocking Mount (Deleted)
- 5.1.9 General Test and Repair Equipment
- 5.1.10 Test Bench
- 5.1.11 Battery and Vacuum Cart

#### 5.2 Storage and Care of Photo Supplies

- 5.2.1 Film Transit Case, Insulated (Deleted)
- 5.2.2 Loaded Magazine and Cassette Transit Case

#### 5.3 Development and Treatment of Sample Data

- 5.3.1 Darkroom and Controlled Processing Equipment
- 5.3.2 Evaluation Equipment

#### 5.4 Storage Racks and Cabinets for Shop

#### 5.5 Configuration Installation and Preflight Checkout Equipment

- 5.5.1 Preflight Checkout Facilities
- 5.5.2 Flight Line Installation Equipment, Slings, Jigs, Alignment Blocks, etc.
- 5.5.3 Standard Transport Dolly
- 5.5.4 Equipment Transport Dollies (deferred)
- 5.5.5 Shelter, Flight Line Installation

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

10 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.1 Camera and Film Drive Test Stands

##### Requirement

Test stands are required to test cameras and film drives without magazines, cassettes, lens, shutters or associated equipment.

For Camera Model HC-730 and Model HC-731, no separate test stand design is required. The cameras will be mounted in the test well of the Test Bench. (See Section 5.1.10)

For Camera Model 73-B a film drive test stand design is required.

For Camera Model 73-C a film drive test stand design is required.

The Electrical Test Set will provide the power monitoring and recording and the Battery and Vacuum Cart will provide the power for all the camera test fixtures.

AERIAL SURVEYING EQUIPMENT  
PROJECT PLAN

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GROUND SUPPORT EQUIPMENT

3.1.1.1 Specification of Film Drive Test Stand for Model 73-B

The film drive test stand will be of light weight construction and will operate in conjunction with the Test Bench for mechanical support and the Electrical Test Set for power.

The test stand will mount the Model 73-B Film Drive Assembly and secure it adequately by its camera mounting adapters. It will be possible to mount and firmly secure the test stand to the Test Bench by reasonably quick facilities. The mechanical arrangement of the stand will be such that maximum visibility and accessibility will be maintained for all of the drive components.

The test stand will provide support and guide means for test film strips and it will be possible to operate the film drive motor to test and observe for excessive film tension, slack, misalignment or mechanical discrepancies in the actuating mechanism. It will be possible to test IMC rate and timing, vacuum timing and valve, shuffle operation, failure indicator operation, supply indicator operation as well as to make mode changes and general adjustments.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

Design Approach

Presently under consideration.

AERIAL SURVEYING EQUIPMENT  
PROJECT PLAN

14 October 1955

GROUND SUPPORT EQUIPMENT

1.1.1.1. Specification of Film Drive Test Stand for Model 73-C

The film drive test stand will be of light weight construction, will operate in conjunction with the Test Bench for mechanical support and the Electrical Test Set for power.

The test stand will mount the Model 73-C Film Drive Assembly and secure it adequately by its camera mounting adapters. It will be possible to mount and firmly secure the test stand to the Test Bench by reasonably quick facilities. The mechanical arrangement of the stand will be such that maximum visibility and accessibility will be maintained for all of the drive components.

The test stand will provide support and quick means for test film strips. The test stand will provide a 115 V AC motor drive to test the film drive system with the test film in place for tension, slackness, misalignment and mistiming. It will be possible to test angular alignment of programmer cams and operation of associated switches, mode changes, speed of metering rolls, IMC, shuffle timing and operation, the vacuum valve for leaks and operation timing, and the Failure Indicator operation as well as to make general adjustments.

A general ground support equipment nameplate will be provided with standard part number.

Finish protection will be suitable for normal shop use.

Design Approach

Presently under consideration.



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### GROUND SUPPORT EQUIPMENT

#### 5.1.2 Magazine and Cassette Test Stands

##### Requirement

Stands are required to support the magazines and cassettes independent of the camera mount and drive facilities. The test stands will provide for the mounting and drive requirements of the magazines and cassettes and will operate in conjunction with the Test Bench, Electrical Test Set and the Battery and Vacuum Cart.

Four test stand designs are required.

- One test stand design for Model HM-730
- One test stand design for Model HM-731
- One test stand design for Cassette 73-B
- One test stand design for Cassette 73-C

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

21 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.2.1 Test Stand for Magazine Model HM-730

##### Specification

A simple open frame aluminum structure will be used. The structure will mount a camera case drive assembly, less lens, shutter assemblies and filter. The drive assembly will form a part of the test stand. The magazine will mount on, and be mechanically driven, by the camera case drive.

The test stand will sit on the Test Bench for operational testing and will be stored separately when not in use. Power, vacuum and meters from the Battery and Vacuum Cart and the Electrical Test Set will externally supply the required power for testing. Dummy film spools will be used to simulate full load characteristics on the magazine. (See Sect. 5.1.2.5)

The magazine will be tested under the following conditions:

Drive shaft speed - nominal 25 RPM

Torque Required - Approximately 20 in. lbs. at +70°F.  
as measured at the drive coupling.

Complete visibility and accessibility to components undergoing test and inspection must be provided for by the test stand.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

The test stand will consist of an open type aluminum structure approximately 10" high, 13" wide and 15" long. The structure will mount the camera case drive assembly by its camera mount provisions. Clearances as required to power and vacuum connections will be provided and the film travel will be easily observed. The structure will provide mounting pads for fastening to the Test Bench. The magazine to be tested will be mounted on the camera drive assembly, as in the camera, the cover will be removed and the dummy film spools will be loaded in the magazine. The magazine will receive, at its camera connections, 28 volt DC power and vacuum requirements from the Battery and Vacuum Cart (See Section 5.1.1) thru cabling as supplied by General Test and Repair Equipment.

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

21 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.2.2 Test Stand for Magazine Model HM-731

##### Specification

A simple open frame aluminum structure will be used. The structure will mount a camera case drive assembly, less lens cone, lens, and shutter assemblies. The drive assembly will form a part of the test stand. The magazine will mount on, and be mechanically driven by the camera case drive.

The test stand will sit on the Test Bench for operational testing and will be stored separately when not in use. Power vacuum and meters from the Battery and Vacuum Cart and the Electrical Test Set will externally supply the required power for testing. Dummy film spools will be used to simulate full load characteristics of the magazine. (See Section 5.1.2.5)

The magazine will be tested under the following conditions:

Drive shaft speed - nominal 25 RPM

Torque required - approximately 35 in. lbs. at +70°F.

Complete visibility and accessibility to components undergoing test and inspection must be provided for by the test stand.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

The test stand will consist of an open type aluminum structure approximately 10" high, 16" wide and 19" long. The structure will mount the camera case drive assembly by its camera mount provisions. Clearances as required to power and vacuum connections will be provided and the film travel will be easily observed. The structure will provide mounting pads for fastening to the Test Bench. The magazine to be tested will be mounted on the camera drive assembly, as in the camera, the cover will be removed and the dummy film spools will be loaded in the magazine. The magazine will receive, at its camera connections, 28 volt DC power and vacuum requirements from the Battery and Vacuum Cart (See Section 5.1.1) thru cabling as supplied by General Test and Repair Equipment.



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

10 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.2.3 Test Stand for Cassettes of Model 73-B

##### Specification

A test stand will mount one cassette of Configuration Model 73-B. It will provide a manual crank facility for driving and measurement of speed and torque. The test stand will sit on a work bench for operational testing and will be stored separately when not in use. No power, vacuum or meters are required.

A simple open frame aluminum structure, approximately 12' high, 20" wide and 26" long will be used. The cassette will be supported by the main shaft allowing for free access to the cassette drive mechanism. Dummy film spools will be used with the test stand to provide full load characteristics on the cassettes. (see Section 5.1.2.5)

A simple takeup spool will be provided for the film strip of the dummy spool used.

The cassette will be tested under the following conditions:

For full loaded spool (146-1/4 lbs. overload weight)

Speed of drive coupling = approximately 17 RPM.

Torque required measured at drive coupling = 2.8 in. lbs.

For empty spool (5-3/4 lbs. spool weight)

Speed of drive coupling = approximately 46 RPM.

Torque required measured at drive coupling = .02 in. lbs.

Torque measurements will be made at the drive coupling with a slip clutch type torque indicator with a range of 0 - 10 in. lbs.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

The structure will consist of a base frame and supporting pedestals for mounting the cassette shaft. The structure will provide for positive vertical orientation of the cassette. Suitable facilities will provide for the manual operation of cycling the loaded and empty spools thru the cassette drive coupling. Torque measurements will be taken at drive coupling under specified conditions with simple torque indicator.



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### GROUND SUPPORT EQUIPMENT

#### 5.1.2.4 Test Stand for Cassette Model 73-C

Identical in Design approach to 73-B test stand except for speed and torque values and mating dimensions of supports.

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.2.5 Dummy Film Spools

##### Requirement

Dummy film spools are required for testing the magazines Models HM-730 and HM-731 and the cassettes Models 73-B and 73-C.

The film spools will be used in conjunction with the magazine and cassette test stands (see Sections 5.1.2.1 thru 5.1.2.4) for the purpose of simulating actual load characteristics of the camera units to be tested.

The use of dummy preloaded film spools will preclude the costs of using actual fresh film for test operations.

##### Specification

The dummy film spools will incorporate all of the size, loading, and mechanical drive requirements of the camera spools. Actual empty camera spools will be used as the basic unit and a suitable material will be so adapted to fulfill the full load specifications of actual film. A film strip of approximately 50' length will be permanently fastened to each dummy film spool for use in drive and cycling operations of the magazines and cassettes.

The following full load specifications, including weight of film and spool will be simulated by the dummy film spools.

For Camera Model HC-730 total weight = 13.5 lbs.

For Camera Model HR-731 total weight = 40 lbs.

For Camera Model 73-B total weight (per 1 cassette) = 145-1/4 lbs. overloading.

For Camera Model 73-C total weight (per 1 cassette) = 105-1/4 lbs. overloading.

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.3 Shutter Test Set

##### Requirement

The shutter test set is used to evaluate the performance of both intralens and focal plane shutters. The information provided by the test set will be presented in a manner that rapid evaluation of shutter performance may be made by skilled personnel. The test set will provide a record for analysis of the test results.

##### Specification

The test set will provide data necessary to evaluate shutter performance in the form of a photograph of an oscilloscope trace. From this trace the following information will be obtained.

##### For intralens shutters:

- a. Elapsed time between initiation of opening and completion of closure.
- b. Shutter efficiency.
- c. Elapsed time between electrical shutter command and initiation of opening.

##### For focal Plane Shutters:

- a. Elapsed time between initiation and completion of slit travel.
- b. Slit width vs traverse position.
- c. Elapsed time between electrical shutter command and initiation of slit travel.
- d. Traverse position vs time.

Shutter difficulties and incipient failures and the recognition of adequate performance and calibration will be obtained by this data.

##### Design Approach

The test set will be a bench type light weight structure containing

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.3 Shutter Test Set

##### Design Approach (Cont'd.)

a diffused constant DC light source. Adapting fixtures will be provided to mount the bodies of each of the intralens shutters Models HS-730, HS-731 and 73-B and the focal plane shutter Model 73-C. Photocell pickup adapters equipped with suitable lens mounts and masks for each of the four type shutters will be provided. Two types of masks are used for the focal plane shutters. Switch and wiring for suitable trigger and shutter pulses will be provided. Shutters will be manually rewound.

A 5" general purpose oscilloscope with triggered sweep and time markers equipped with a polaroid land camera and a D.C. vertical amplifier, as part of general test equipment, will be used with the shutter test set. The oscilloscope traces will be plots of light intensity, time, slit positions etc. Depending on the shutter tested and mask used.

The shutter to be tested will be fastened into the test set by its mount adapter. One side of the shutter will be illuminated by the D.C. light source. A lens will be mounted on the test set in a position that any light passing thru the shutter will be focused on a photocell. The photocell will be connected to the input of the oscilloscope.

The masks will be used to calibrate the sensitivity of the system. A mask will mount in the adapter of the shutter to be tested and will have a hole in its center of the size and shape as to simulate the full open shutter. A push button will be connected to supply electrical power to trigger the shutter and to trigger the scope trace.

The scope display for an interlens shutter will be a plot of light intensity VS time. Markers superimposed on the trace will permit the measurement of time. The vertical sensitivity of the system will be calibrated by means of the mask to determine if the shutter opened fully.

For a focal plane shutter the scope display will show light intensity VS slit position. From this the slit width, slit width variation with position, total slit travel time and elapsed time between the trigger and beginning of slit travel may be determined.

The test stand will require 115 V, 60 cps, 200 watts and 28V DC, 5 amp.

The test stand will operate in conjunction with the Battery and Vacuum cart. (See Section 5.1.14) for power and will sit on the Test Stand (See Sect. 5.1.10)



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### GROUND SUPPORT EQUIPMENT

#### 5.1.4. Electrical Test Set

##### Requirement

To provide complete monitored checkout under power of configurations, or components thereof, it is required that an electrical test set design be provided. The test set would form a part of shop, storage and field operations. The test set will be easily transported by manual handling.

The electrical test set will sit on the Test Bench and the Preflight Test Stand and will in conjunction with the Battery and Vacuum Cart and various specialized test sets provide the facilities necessary to perform maintenance tests in any of the electrical or electromechanical portions of the cameras either in the shop, storage area, or on the field.

The specific assemblies to be tested by the electrical test set are:

- a. Complete Configuration
- b. Camera Film Drive
- c. Complete Camera
- d. Magazine
- e. Shutter
- f. Camera Body
- g. Programmer
- h. Servo System
- i. Rocking Mount
- k. Stabilized Mount
- l. Image Motion Compensation
- m. Power Junction Box

##### Specification

Physically the test set will consist of a light weight box type container which will fold up to form its own packing case. Approximate size of the container will be 15" wide, 15" deep and 24" long. It will be provided with external handles for manual carrying. All devices of the test set will be adequately secured and protected during transport.

The test set will have mounted as a permanent part a test panel which will contain the required meters, indicator lights, test switches and connectors.

The test set will receive 28 volt DC power from the Battery and Vacuum Cart. Overload protection and monitoring facilities for this will be on the power cart. The set will receive 115 volt 60 cycle power from an external source and be distributed on the test panel.

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

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### GROUND SUPPORT EQUIPMENT

#### 5.1.4 Electrical Test Set

##### Specification (Cont'd.)

##### 1. 28 Volt DC System

The incoming 28 volt DC power received from the power cart will be distributed to the test panel and to connectors for external use.

##### 2. Simulated Power Junction Box

A junction box similar to that used in the aircraft will provide distribution of the DC power to various components under test. The junction box will also facilitate the checking of circuits within the camera configuration which supply power and signals to other parts of the aircraft.

##### 3. Simulated Hand Control and Computer

This portion of the test panel will contain the mode selector switch, indicator lights, IMC command, position command, B anticipation, and B. pulse. The commands will be generated in a manner which will make the interpretation of the system response feasible.

##### 4. Intervalometer

A simple intervalometer will be provided to permit repeated operation of the cameras independent of the configuration programmer.

##### 5. Ammeters

Three separate ammeters will be provided to measure current drawn by camera motors. Their measurements will be used to provide information about motor loads.

##### 6. Auxillary Equipment

The test bench will be equipped to make tests in conjunction with auxillary test equipment. This equipment includes:

- a. Shutter test set including oscilloscope. (Sect. 5.1.3)
- b. Event recorder (Sect. 5.1.9)
- c. Oscillograph Recorder (Sect. 5.1.9)
- d. Magazine Test Stand (Sect. 5.1.2.1 & 5.1.2.2)
- e. Camera Test Fixtures (Sect. 5.1.1)
- f. Oscillating Table (Sect. 5.1.6)
- g. Vacuum Tube Voltmeter (Sect. 5.1.9)

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5 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.5 IMC Test Accessories

##### Requirement

It is required to test each configuration to determine that the Image Motion Compensation rate is operationally correct during the cycle time where the shutter is open.

No special structures will be required. The testing of IMC will be conducted on the configuration while supported by its transit frame for shop operations or while mounted in the airplane in the fieldline position.

The Electrical Test Set in conjunction with the Battery and Vacuum Cart will provide all the power and power monitoring required for the test. Recording instruments will be provided as part of General Test and Repair Equipment.

##### Specification

For test specifications, it is required to differentiate between fixed IMC and servo-controlled IMC.

The fixed rate IMC will be tested by operating the configuration and recording the proportional electrical output of either a position or velocity sensitive transducer. The transducer will be of velocity type, if possible, to reduce the amount of calculation necessary to determine the IMC rate to a minimum. The transducer will form an accessory part to the configuration.

The servo-controlled IMC will be tested by mounting a transducer on the mirror and operating the configuration and recording the voltage output of the transducer. A manual stepping command switch for each servo will be provided on the Electrical Test Set to generate the test signal. Additional checks will be made on the IMC by means of the event recorder of general test equipment and index marks on the IMC assembly.

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### GROUND SUPPORT EQUIPMENT

#### 5.1.6 Mini-Vib Test Set

##### Requirement

For the purpose of assurance of optimum photographic results it is required that a test set be provided to predetermine the performance of the Mini-Vib assembly by correct simulation of operational vibration conditions.

The Mini-Vib test set would form a part of the shop operations.

The test set will mount on the Test Bench and will operate in conjunction with the Electrical Test Set, the Battery and Vacuum Cart and associated signal recording equipment.

##### Specification

The test set will consist of an open frame aluminum structure so designed to provide a mounting platform for the Mini-Vib unit. The test set will be motor driven to produce a single axis oscillation of the mounting platform. It will be possible to produce calibrated oscillations of controlled frequency and amplitude which may be varied approximately plus or minus 20% around the required vibration threshold level. A standard ohmmeter will be used to monitor the output pulse. The Mini-Vib unit will be physically positioned and repositioned on the oscillating platform for the test of each of its gyro axes.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

Presently undergoing development.



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

21 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.7 Mount, Camera 73C

##### Requirement

The Camera 73C mount is required to be tested to determine its capability of holding the camera movement below the required level to insure good pictures.

##### Specifications

Deferred pending camera design.

**AERIAL SURVEYING EQUIPMENT  
PROJECT PLAN**

**11 November 1955**

**PART II**

**GROUND SUPPORT EQUIPMENT**

**5.1.8 Rocking Mount Test Set**

**Requirement deleted.**

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

11 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.9 General Test, Repair and Supply Equipment

##### 5.1.9.1 Tool Kit, Field Representatives.

Each member of the photo service team will be supplied with an individual tool kit as indicated in purchase parts list 735451.

##### 5.1.9.2 Service Shop Tools

Each photo service team will be provided with one set of service shop tools as indicated on purchased parts list 735452.

##### 5.1.9.3 Initial Stock of Supplies.

Each photo service team will be provided with an initial stock of supplies as indicated on purchase parts list 735453. When exhausted, this stock of supplies must be replenished through normal supply channels.

##### 5.1.9.4 Tote Box Bench



## PURCHASE PARTS LIST Tool Kits, Field Representatives

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End Item #52

(Partial List)

A

| PART NO. | DESCRIPTION  | MFR. OR SPEC.                                | TYPE NO. | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|--|--|----------|---------------|-------------|-----------------|-------|
| 001      | Tool Chest, General Mechanics Kit                      | Kennedy #1018                                |          |               |             | 15              |       |
| 002      | Diagonal Pliers w/spring - 5"                          | Crestaloy #934                               |          |               |             | 15              |       |
| 003      | Straight Nose Combination Pliers 6"                    | Crescent                                     |          |               |             | 15              |       |
| 004      | Needle nose Pliers 6"                                  | Crestaloy #777                               |          |               |             | 15              |       |
| 005      | Curved Needle nose Pliers 6"                           | Crescent                                     |          |               |             | 15              |       |
| 006      | Socket Wrench set 1/4" drive w/metal case S&K 3/16-3/8 |  |          |               |             | 15              |       |
| 007      | Combination box & open end set                         | 7/16-3/4" P & C                              |          |               |             | 15              |       |
| 008      | Allen Wrench Set                                       | Holo-Krome                                   |          |               |             | 15              |       |
| 009      | Common Screw Driver                                    | Stanley Defiance #3006<br>3/16x3 round blade |          |               |             | 15              |       |
| 010      | Phillips Screw Driver #2                               | Stanley #2702                                |          |               |             | 15              |       |
| 011      | Brass Hammer   | Proto - 1-3/4"                               |          |               |             | 15              |       |
| 012      | Soft faced Hammer - Plastic                            | Stanley 8 oz.                                |          |               |             | 15              |       |
| 013      | 'Grab-All' Tool 12"                                    |  |          |               |             | 15              |       |
| 014      | Tweezers   | Dumont #12                                   |          |               |             | 15              |       |
| 015      | Crescent Wrench 6"                                     |  |          |               |             | 15              |       |
| 016      | Rule 6"  | Starrett                                     |          |               |             | 15              |       |
| 017      | Offset Screwdriver                                     | Yankee                                       |          |               |             | 15              |       |
| 018      | Soldering Iron, Pencil type w/interchangeable tips     | Am. Beau. #3128                              |          |               |             | 15              |       |
| 019      | Tape steel 6'  | Stanley #346                                 |          |               |             | 15              |       |

rm No. 1121 (11-54)



735451

A

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PURCHASE PARTS LIST Tool Kits, Field Representatives

End Item #52

| PART NO. | DESCRIPTION | MFR. OR OPTC | TYPE NO. | QTY PER UNIT | MFG. SPARE | TOTAL FOR UNIT | NOTES |
|----------|-------------|--------------|----------|--------------|------------|----------------|-------|
| 039      | Comb, Lock  |              |          |              |            |                |       |
| 040      |             |              |          |              |            |                |       |
| 041      |             |              |          |              |            |                |       |
| 042      |             |              |          |              |            |                |       |
| 043      |             |              |          |              |            |                |       |
| 044      |             |              |          |              |            |                |       |
| 045      |             |              |          |              |            |                |       |
| 046      |             |              |          |              |            |                |       |
| 047      |             |              |          |              |            |                |       |
| 048      |             |              |          |              |            |                |       |
| 049      |             |              |          |              |            |                |       |
| 050      |             |              |          |              |            |                |       |
| 051      |             |              |          |              |            |                |       |
| 052      |             |              |          |              |            |                |       |
| 053      |             |              |          |              |            |                |       |
| 054      |             |              |          |              |            |                |       |
| 055      |             |              |          |              |            |                |       |
| 056      |             |              |          |              |            |                |       |
| 057      |             |              |          |              |            |                |       |

## PURCHASE PARTS LIST General Test &amp; Repair Equipment &amp; Supplies

PAGE 1 OF 4

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End Item #52 (Partial List)

| PART NO. | DESCRIPTION                         | MFR. OR SPEC.               | TYPE NO.                     | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|-------------------------------------|-----------------------------|------------------------------|---------------|-------------|-----------------|-------|
| 001      | VTVM                                |                             |                              |               |             |                 |       |
| 002      | Oscilloscope, 5"/w 53A Amplifier    | Tektronic                   | Mod. 531                     |               |             |                 |       |
| 003      | Multimeter                          | Simpson                     | 260                          |               |             |                 |       |
| 004      | Strobotac                           | Gen. Radio                  | 631BL                        |               |             |                 |       |
| 005      | Tester, Dynamic Output, Tube        | Jackson                     | 637                          |               |             |                 |       |
| 006      | Hand Drill, Elect. 1/4" chuck       | Model #47<br>Skil Drill #75 | Union #33W836                |               |             |                 |       |
| 007      | Soldering Iron, Elect. 200 w.       | Am. Beauty No. 3158         | Union #4G7841                |               |             |                 |       |
| 008      | Micrometer - Inside .000-1"         | Starrett No. 700            | Union #A-5374                |               |             |                 |       |
| 009      | Micrometer - Outside 0-1"           | Starrett No. 231 or 231F    | Union A-5338<br>Union A-5354 |               |             |                 |       |
| 010      | Adapter - Oscill. Recording 5"      | Tektronic                   | BE-510                       |               |             |                 |       |
| 011      | Oscilloscope Recording Camera f/1.9 | Dumont                      | Type 497                     |               |             |                 |       |
| 012      | Gage - Thickness                    | Starrett #467               | Union 2A5587                 |               |             |                 |       |
| 013      | Wire Strippers                      | Walsco No. 590              | Shelly, R.M.                 |               |             |                 |       |
| 014      | Pliers - Vise Grip                  | Vise Grip #10               | Union N6852                  |               |             |                 |       |
| 015      | Wrench-Sockets 3/8" Drive Set       | S-K-4517 or 4517W           | Union 2N9395                 |               |             |                 |       |
| 016      | Wrench-Crescent 4"                  | P&C No. 1704                | Union 2N5805                 |               |             |                 |       |
| 017      | Screwdriver - Phillips #1           | Stanley No. 2701            | Garrett                      |               |             |                 |       |
| 018      | Screwdriver - Jewellers (set)       | Starrett 555                | Union 2A5849                 |               |             |                 |       |
| 019      | Rule - Steel - 12"                  | Starrett 607                | Union 2A4983                 |               |             |                 |       |



## PURCHASE PARTS LIST General Test &amp; Repair Equipment &amp; Supplies

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End Item #52

| PART NO. | DESCRIPTION                      | MFG. OR SPEC.               | TYPE NO.       | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|----------------------------------|-----------------------------|----------------|---------------|-------------|-----------------|-------|
| 0        | Combination Square 12"           | Starrett 33                 | Union 2A5091   |               |             |                 |       |
| 1        | Torque Wrench - 0-25 in. #8      | Sturtevant F25-1            | Dillon Stevens |               |             |                 |       |
| 2        | Torque Wrench - 0-100 lb #8      | Sturtevant F100-1           | Dillon Stevens |               |             |                 |       |
| 3        | Battery Charger                  | C.R. 6                      |                |               |             |                 |       |
| 4        | Wrench - Crescent 10"            | P&C 1710                    | Union 2N5808   |               |             |                 |       |
| 5        | Wrench - Pipe 10"                | P&C 1810                    | Union 2N5823   |               |             |                 |       |
| 6        | Drill Set                        | Cleveland 11                | Union 2W1830   |               |             |                 |       |
| 7        | Drill Set                        | Cleveland 84                | Union 2W1823   |               |             |                 |       |
| 8        | Drill Set                        | Cleveland 88                | Union 2W1834   |               |             |                 |       |
| 9        | Eye - out set                    | Cleveland 20                | Union 2W1818   |               |             |                 |       |
| 0        | Punch - Drive Set                | Starrett 565-8              | Union 2A5789   |               |             |                 |       |
| 1        | Punch - Center                   | Starrett 18A                | Union 2A5760   |               |             |                 |       |
| 2        | Hack Saw                         | Miller Falls No. 1027       | Union 2A1937   |               |             |                 |       |
| 3        | Blades - Hack saw                |                             |                |               |             |                 |       |
| 4        | Drill Vise - Portable            | Miller Falls No. 217        | Union 2W9349   |               |             |                 |       |
| 5        | Hammer - Plastic Head 1-1/2 size | S.W. Pyralin<br>Mallet Head | Garrett        |               |             |                 |       |
| 036      | Screwdriver - Phillips #3        | Stanley 2703                | Garrett        |               |             |                 |       |
| 037      | Screwdriver - Phillips #4        | Stanley 2704                | Garrett        |               |             |                 |       |
| 038      | Wrench Splint Set                | Steven Walker T-73          | Garrett        |               |             |                 |       |

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## PURCHASE PARTS LIST General Test &amp; Repair Equipment &amp; Supplies

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End Item #52

| PART NO. | DESCRIPTION                  | MFR OR SPEC. | TYPE NO. | QTY PER UNIT | MFG SPARES | TOTAL FOR UNITS | NOTES |
|----------|------------------------------|--------------|----------|--------------|------------|-----------------|-------|
|          | Tachometer, Hand             |              |          |              |            |                 |       |
|          | Inverter 145 V, 400 cycle    |              |          |              |            |                 |       |
|          | Rotary Type Vacuum Generator | Red Point    | VG529-05 |              |            |                 |       |
|          | 1/2" C" Clamps 2"            |              |          |              |            |                 |       |
|          | 1/2" C" Clamps 6"            |              |          |              |            |                 |       |
|          | Press - Drops Oil            |              |          |              |            |                 |       |
|          | Fishscale 0-25 lbs.          |              |          |              |            |                 |       |
|          | Fishscale 0-100 lbs.         |              |          |              |            |                 |       |
|          | First Aid Kit                | Palmer #2    |          |              |            |                 |       |
|          | Machine Screw Tap            | Marshall T&S | 4-40     |              |            |                 |       |
|          | Machine Screw Tap            | Marshall T&S | 6-32     |              |            |                 |       |
|          | Machine Screw Tap            | Marshall T&S | 8-32     |              |            |                 |       |
|          | Machine Screw Tap            | Marshall T&S | 10-24    |              |            |                 |       |
|          | Machine Screw Tap            | Marshall T&S | 10-32    |              |            |                 |       |
|          | Std. Hand Tap                | Marshall T&S | 1/4-20   |              |            |                 |       |
|          | Std. Hand Tap                | Marshall T&S | 1/4-28   |              |            |                 |       |
|          | Std. Hand Tap                | Marshall T&S | 5/16-18  |              |            |                 |       |
|          | Std. Hand Tap                | Marshall T&S | 3/8-16   |              |            |                 |       |
|          | Std. Hand Tap                | Marshall T&S | 3/8-24   |              |            |                 |       |



## PURCHASE PARTS LIST General Test &amp; Repair Equipment &amp; Supplies

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End Item #52

| PART NO. | DESCRIPTION                          | MFR. OR SPEC. | TYPE NO.      | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|--------------------------------------|---------------|---------------|---------------|-------------|-----------------|-------|
| 58       | Combination Drill & Countersink      | Marshall      | A-1           |               |             |                 |       |
| 59       | Combination Drill & Countersink      | Marshall      | C-2           |               |             |                 |       |
| 60       | Oil Can                              | Eagle #13F    | Union 4F2556  |               |             |                 |       |
| 61       | Counter Sink                         | UG-82 Ford    |               |               |             |                 |       |
| 62       | Counter Sink                         | UG-90 Ford    |               |               |             |                 |       |
| 63       | Counter Sink                         | UG-100 Ford   |               |               |             |                 |       |
| 64       | Shears - Sheet Metal                 | #M3 W188      | Garrett P.364 |               |             |                 |       |
| 65       | Arkansas Stone                       | 1/4 x 1/4     | Gallen        |               |             |                 |       |
| 66       | Waste Can, Film 8-1/2 Gal. Cap.      | U.S.A. No 50  |               |               |             |                 |       |
| 67       | Bench Vice                           |               |               |               |             |                 |       |
| 68       | Battery Jumpers 1' Connector one end |               |               |               |             |                 |       |
| 69       | Battery Jumper 6' Connector one end  |               |               |               |             |                 |       |
| 70       | Hydrometer                           |               |               |               |             |                 |       |
| 71       | Portable Lamp 25'                    |               |               |               |             |                 |       |
| 72       | Vacuum Cleaner                       | (Lowy)        |               |               |             |                 |       |
| 073      | Oscillograph                         |               |               |               |             |                 |       |
| 074      | Event Recorder                       |               |               |               |             |                 |       |
| 075      | Intervalometer                       |               |               |               |             |                 |       |
| 076      |                                      |               |               |               |             |                 |       |

Form No. 1121 (U-54)

# PURCHASE PARTS LIST Initial Stock of Supplies

End Item #52 (Partial List)

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| PART | DESCRIPTION                        | MFR. OR SPEC. | TYPE NO.  | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|------|------------------------------------|---------------|-----------|---------------|-------------|-----------------|-------|
|      | Inst. Oil                          | MIL-L-7870    |           |               |             |                 |       |
|      | Grease                             | MIL-G-3287    |           |               |             |                 |       |
|      | Self Tapping Screws                | Assorted      |           |               |             |                 |       |
|      | Drive Screws                       | Assorted      |           |               |             |                 |       |
|      | Acetone C. P.                      |               |           |               |             |                 |       |
|      | 3M Weather stripping Cement        |               |           |               |             |                 |       |
|      | Grain Alcohol C. P.                |               |           |               |             |                 |       |
|      | Lock Wire                          | AN 995-B-32   |           |               |             |                 |       |
|      | Combination Locks                  |               |           |               |             |                 |       |
|      | Alligator Clips (Black & red)      |               |           |               |             |                 |       |
|      | Wire Test Lead (Red)               |               |           |               |             |                 |       |
|      | Wire Test Lead (Black)             |               |           |               |             |                 |       |
|      | Tape, Plastic Electrical           |               |           |               |             |                 |       |
|      | Tape, Friction                     |               |           |               |             |                 |       |
|      | Shop Rags                          |               |           |               |             |                 |       |
| 6    | Vacuum Hose 1/4" I. D.             | 1/8" wall     |           |               |             |                 |       |
| 7    | Carbon Tetrachloride C. P.         |               |           |               |             |                 |       |
| 3    | Sta-Kon 2 way Insulated Connectors |               | No. 2B-16 |               |             |                 |       |
| 2    | Sta-Kon 2 way Insulated Connectors |               | No. 2C-12 |               |             |                 |       |

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PURCHASE PARTS LIST INITIAL STOCK IN SUPPLIES

End Item #52

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| PART NO. | DESCRIPTION                | U/P OR SPEC | TYPE NO.     | QTY PER UNIT | U/P SPARE | TOTAL FOR UNIT | NOTES |
|----------|----------------------------|-------------|--------------|--------------|-----------|----------------|-------|
| 1        | Solder 40-60               |             | Union 22-139 |              |           |                |       |
| 2        |                            |             |              |              |           |                |       |
| 3        |                            |             |              |              |           |                |       |
| 4        | 16 V. Batteries HT-11-46   | WILLIAMSON  |              |              |           |                |       |
| 5        | Plug Twist Locks           |             |              |              |           |                |       |
| 6        | Wire 2 Conductor           |             |              |              |           |                |       |
| 7        | Wire 3 Conductor           |             |              |              |           |                |       |
| 8        | Connectors                 |             |              |              |           |                |       |
| 9        | Bench Duster               |             |              |              |           |                |       |
| 10       | Red Glyphal                |             |              |              |           |                |       |
| 11       | Fungus Res. Varnish        |             |              |              |           |                |       |
| 12       | Floor Mop                  |             |              |              |           |                |       |
| 13       | Bucket w/ squeeze wring    |             |              |              |           |                |       |
| 14       | Ajax Cleaner               |             |              |              |           |                |       |
| 15       | Duz Soap                   |             |              |              |           |                |       |
| 16       | Lab Towels                 |             |              |              |           |                |       |
| 17       | Apron Dark Room            |             |              |              |           |                |       |
| 18       | S.S. wire for print drying |             |              |              |           |                |       |
| 19       | Lens Tissue                |             |              |              |           |                |       |
| 20       | Negative Pencils           |             |              |              |           |                |       |

# PURCHASE PARTS LIST Initial Stock of Supplies

End Item #52

PAGE 3 OF 3

735453

| PART NO. | DESCRIPTION              | MFR. OR SPEC. | TYPE NO. | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|--------------------------|---------------|----------|---------------|-------------|-----------------|-------|
| 9        | Sponges                  |               |          |               |             |                 |       |
| 0        | D-19                     |               |          |               |             |                 |       |
| 1        | Hypo                     |               |          |               |             |                 |       |
| 2        | Splicing Tape            |               |          |               |             |                 |       |
| 3        | Making Tape (Black)      |               |          |               |             |                 |       |
| 4        | Distilled Water          |               |          |               |             |                 |       |
| 5        | Garden Hose              |               |          |               |             |                 |       |
| 6        | Black Touch Up Spray Can |               |          |               |             |                 |       |
| 7        |                          |               |          |               |             |                 |       |
| 8        |                          |               |          |               |             |                 |       |
| 9        |                          |               |          |               |             |                 |       |
| 10       |                          |               |          |               |             |                 |       |
| 11       |                          |               |          |               |             |                 |       |
| 12       |                          |               |          |               |             |                 |       |
| 13       |                          |               |          |               |             |                 |       |
| 14       |                          |               |          |               |             |                 |       |
| 15       |                          |               |          |               |             |                 |       |
| 16       |                          |               |          |               |             |                 |       |
| 17       |                          |               |          |               |             |                 |       |
| 18       |                          |               |          |               |             |                 |       |
| 19       |                          |               |          |               |             |                 |       |
| 20       |                          |               |          |               |             |                 |       |
| 21       |                          |               |          |               |             |                 |       |
| 22       |                          |               |          |               |             |                 |       |
| 23       |                          |               |          |               |             |                 |       |
| 24       |                          |               |          |               |             |                 |       |
| 25       |                          |               |          |               |             |                 |       |
| 26       |                          |               |          |               |             |                 |       |
| 27       |                          |               |          |               |             |                 |       |
| 28       |                          |               |          |               |             |                 |       |
| 29       |                          |               |          |               |             |                 |       |
| 30       |                          |               |          |               |             |                 |       |
| 31       |                          |               |          |               |             |                 |       |
| 32       |                          |               |          |               |             |                 |       |
| 33       |                          |               |          |               |             |                 |       |
| 34       |                          |               |          |               |             |                 |       |
| 35       |                          |               |          |               |             |                 |       |
| 36       |                          |               |          |               |             |                 |       |
| 37       |                          |               |          |               |             |                 |       |
| 38       |                          |               |          |               |             |                 |       |
| 39       |                          |               |          |               |             |                 |       |
| 40       |                          |               |          |               |             |                 |       |
| 41       |                          |               |          |               |             |                 |       |
| 42       |                          |               |          |               |             |                 |       |
| 43       |                          |               |          |               |             |                 |       |
| 44       |                          |               |          |               |             |                 |       |
| 45       |                          |               |          |               |             |                 |       |
| 46       |                          |               |          |               |             |                 |       |
| 47       |                          |               |          |               |             |                 |       |
| 48       |                          |               |          |               |             |                 |       |
| 49       |                          |               |          |               |             |                 |       |
| 50       |                          |               |          |               |             |                 |       |
| 51       |                          |               |          |               |             |                 |       |
| 52       |                          |               |          |               |             |                 |       |
| 53       |                          |               |          |               |             |                 |       |
| 54       |                          |               |          |               |             |                 |       |
| 55       |                          |               |          |               |             |                 |       |
| 56       |                          |               |          |               |             |                 |       |
| 57       |                          |               |          |               |             |                 |       |
| 58       |                          |               |          |               |             |                 |       |
| 59       |                          |               |          |               |             |                 |       |
| 60       |                          |               |          |               |             |                 |       |
| 61       |                          |               |          |               |             |                 |       |
| 62       |                          |               |          |               |             |                 |       |
| 63       |                          |               |          |               |             |                 |       |
| 64       |                          |               |          |               |             |                 |       |
| 65       |                          |               |          |               |             |                 |       |
| 66       |                          |               |          |               |             |                 |       |
| 67       |                          |               |          |               |             |                 |       |
| 68       |                          |               |          |               |             |                 |       |
| 69       |                          |               |          |               |             |                 |       |
| 70       |                          |               |          |               |             |                 |       |
| 71       |                          |               |          |               |             |                 |       |
| 72       |                          |               |          |               |             |                 |       |
| 73       |                          |               |          |               |             |                 |       |
| 74       |                          |               |          |               |             |                 |       |
| 75       |                          |               |          |               |             |                 |       |
| 76       |                          |               |          |               |             |                 |       |
| 77       |                          |               |          |               |             |                 |       |
| 78       |                          |               |          |               |             |                 |       |
| 79       |                          |               |          |               |             |                 |       |
| 80       |                          |               |          |               |             |                 |       |
| 81       |                          |               |          |               |             |                 |       |
| 82       |                          |               |          |               |             |                 |       |
| 83       |                          |               |          |               |             |                 |       |
| 84       |                          |               |          |               |             |                 |       |
| 85       |                          |               |          |               |             |                 |       |
| 86       |                          |               |          |               |             |                 |       |
| 87       |                          |               |          |               |             |                 |       |
| 88       |                          |               |          |               |             |                 |       |
| 89       |                          |               |          |               |             |                 |       |
| 90       |                          |               |          |               |             |                 |       |
| 91       |                          |               |          |               |             |                 |       |
| 92       |                          |               |          |               |             |                 |       |
| 93       |                          |               |          |               |             |                 |       |
| 94       |                          |               |          |               |             |                 |       |
| 95       |                          |               |          |               |             |                 |       |
| 96       |                          |               |          |               |             |                 |       |
| 97       |                          |               |          |               |             |                 |       |
| 98       |                          |               |          |               |             |                 |       |
| 99       |                          |               |          |               |             |                 |       |
| 100      |                          |               |          |               |             |                 |       |



## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

31 October 1955

### GROUND SUPPORT EQUIPMENT

#### 5.1.9.4 Tote Box Bench

##### Requirement

To provide facilities for complete operational checkout of configurations, or components thereof, it is required that a service bench design be provided. The bench would form a part of the shop equipment basically but would be used at the flightline in case of emergency repairs.

The bench will provide storage area to house small hand tools, a limited quantity of general supplies including common hardware, etc. and selected camera spare parts.

##### Specification

The bench will consist of a light weight box type container which will provide fold-up features to form a protected self-contained tote box that may be shipped without the use of packing cases. The bench will be approximately 34" high, 36" wide and 72" long.

The bench will provide two sections of drawers, six drawers to each section and a knee well, or compartment area, for storage. The top surface of the bench will provide a clear unobstructed work area.

The tote box bench will have mounted as a permanent part, a plug-in panel for 115 volt 60 cycle power output and will be wired for the same power input.

As transporting facilities, the test bench will have lift hooks for overhead hoisting and it will be possible to lift the bench by fork lift.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

The bench basically will be of aluminum frame construction with plywood enclosing the sides. The top surface will be tempered masonite.

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### GROUND SUPPORT EQUIPMENT

#### 5.1.9.4 Tote Box Bench

##### Design Approach (Cont'd.)

The bench length will be divided into three equal sections. The two outer sections will contain six drawers each, approximately 20" wide and ranging from 3" to 6" deep. The drawers will operate easily on good quality standard slides. The center section will provide a clear unobstructed area for storage of larger equipment or will be used as a knee well. All sections will be enclosed by a drop lid type panel which will hinge at the top and fasten at the bottom of the bench for transport.

The stand will be wired for 115 volt 60 cycle power input at the end and will provide four outlet plugs in a front panel.

Lift hooks of standard make will be provided on the end panels of the bench for lifting by overhead hoist and for lashing down during transport.

There will be no loose or unattached parts making up the bench.

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### GROUND SUPPORT EQUIPMENT

#### 3.1.10 Test Bench

##### Requirements

To provide facilities for complete operational checkout of configuration, or components thereof, it is required that a test bench design be provided. The test bench would form a part of the shop equipment.

The test bench in conjunction with the Electrical Test Set (See Section 3.1.4.) and various specialized camera component test sets will provide the facilities necessary to perform maintenance tests and to isolate faulty components in any of the electrical or electro-mechanical portions of the cameras.

The specific assemblies to be tested on or in conjunction with the test bench.

- a. Complete Configuration
- b. Camera Film Drive Stands
- c. Complete Camera (See Specification)
- d. Magazine Test Stand
- e. Cassette Test Stand
- f. Shutter Test Stand
- g. Camera Body
- h. Programmer
- j. Servo System
- k. Rocking Mount
- l. Image Motion Compensation
- m. Stabilized Mount
- n. Power Junction Box

##### Specification

The test bench will be of light weight construction, incorporating fold-up features to form a protected self-contained unit that may be shipped without the use of packing cases. The test bench will contain a "test well" to mount, at a convenient operating height, a Camera Model HC-730 or a Camera Model HR-731. The bench will be approximately 34" high, 36" wide and 60" long.

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#### 5.1.10 Test Bench

##### Specification (cont'd.)

The test bench will have mounted as a permanent part, a plug-in panel for 115 volt cycle power output, and will be wired for the same power input.

The test bench will provide a mount for the Electrical Test Set which will contain all the monitoring and test devices for operational testing and will provide 115 volt 60 cycle power to the Battery and Vacuum cart.

As transporting facilities, the test bench will have lift hooks for overhead hoisting and it will be possible to lift the bench by fork lift.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for normal shop use.

##### Design Approach

The test stand basically will be of aluminum frame construction with plywood material enclosing the sides. The top surface will be aluminum plate with linoleum cover.

The stand will be rigid and sufficiently strong to support the camera, camera components and specialized test sets as described in the specifications of this document. The top surface will be utilized for mounting the various test sets and will provide means for their fastening devices.

The test stand will provide a "test well", an opening approximately 15" wide and 30" deep to house and support the cameras as described in the specification. Free access to all camera operating plugs will be provided in the design of the "test well". The lower area of the stand will contain compartments to house recorders and small specialized parts used for component testing. Two drawers will be provided for small specialized hand tools used. The stand will be wired for 115 volts 60 cps power input at the end and will provide four outlet plugs in a front panel.

The designer will restrict the use of loose or unattached members making up the test bench. It will be possible to completely enclose the test bench, less the test well area, by quick fold up and latching provisions to form its own packing case.



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### GROUND SUPPORT EQUIPMENT

#### 5.1.11 Battery and Vacuum Cart

##### Requirement

A portable source of 28 V DC, and 5" Hg. vacuum is required for operation of configurations and components where ever maintenance and test operations are made.

A specially designed power cart containing batteries, a vacuum pump, storage drawers, and a work space will fulfill the requirement.

The power cart will be used under the following conditions:

It will operate in conjunction with the Test Bench, and the Electrical Test Set for shop testing, the Electrical Test Set in the storage area and the Preflight Test Bench and the Electrical Test Set in the preflight test position for all configuration or component tests.

##### Specification

A standard light weight two deck cart with 4 wheels and a push bar will be utilized as the basic frame for this equipment. The dimensions will be approximately 34" high, 24" wide, and 32" long.

- 2 batteries, as furnished, complete with wiring facilities.
- 1 vacuum pump and tank, as furnished, complete with motor drive and wiring.
- 1 instrument panel for DC power monitoring.
- 2 storage drawers.

The top surface will present an unobstructed flush work area.

The batteries will be fully accessible on the lower platform of the cart for all servicing. The batteries will be adequately clamped down. Battery current will be controlled and monitored at an instrument panel and will be presented thru an AN3104-28-21P connector.

The vacuum pump unit will be secured to the lower platform of the cart by quick operate type fasteners. The vacuum pump motor will operate on 115 volt AC, 60 cycle current. 25' of extension cord will be pendant to the vacuum pump motor and it will have a standard size, 3 wire, rubber covered Hubbel twist-lock connector.

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### GROUND SUPPORT EQUIPMENT

#### 5.1.11 Battery And Vacuum Cart

##### Specification (Cont'd.)

Where ever possible AN fittings, hardware and components will be utilized.

Finishing will render the equipment sufficiently weatherproof only for inside shop storage.

##### Design Approach

The basic cart will consist of a riveted 2" aluminum angle frame construction. The lower deck will be covered with 3/4" plywood, the upper deck will be covered with 1/4" tempered masonite. Both upper and lower decks will present flush type surfaces with no framing members extending above the decking. Two drawers, approximately 7" deep and 14" long, will be mounted under the upper deck. Drawers will be so designed that they will not accidentally open during transportation of the cart. The cart will have a push bar for manual operation. The cart will be equipped with two directionally fixed and 2 castoring type 8" diameter semi-pneumatic wheels. The castorable wheels will be located at the push bar end of the cart.

The DC power system will consist of 2 Willard 96 volt lighting system storage batteries Model #WHT-11-8. Suitable cabling will be provided to the instrument panel for power monitoring.

The vacuum system will consist of 1 complete Red Point Products Model #551-OS Vacuum Set with 25' of pendant cord. The vacuum motor will be supplied with 115 V A.C. 60 cycle current from an external source.



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### GROUND SUPPORT EQUIPMENT

#### 5.1.11 Battery and Vacuum Cart

##### Design Approach (Cont'd.)

The instrument panel will be of 1/8" aluminum plate upon which will mount the following:

- 1 Weston Model 301 DC Ammeter Range 0-50 Amp.
- 1 Weston Model 301 DC Voltmeter Range 0-50 volts.
- 1 Dialite #10-18-14-432 Green Pilot Light
- 1 Klixon #C6363-1-30 Switch Type Circuit Breaker.

The panel will physically be located under the push bar for protection.

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### GROUND SUPPORT EQUIPMENT

#### 5.2 Storage and Care of Photo Supplies

##### Requirement

It is imperative that film, both raw and exposed, be maintained under specific controlled conditions as to humidity and temperature. Excessive heat conditions will tend to fog film.

Loss of humidity in emulsion and base will tend to make the film brittle. It is therefore necessary that certain precautions be exercised in the transport and storage of film.

##### 5.2.1 Film Transit Case, Conditioned

This item has been deleted.



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### GROUND SUPPORT EQUIPMENT

#### 5.2.2 Loaded Magazine and Cassette Transit Case

##### Requirement

Since loaded magazines and cassettes are not transported on the cameras, a separate insulated transit case design is required.

A single case will provide mounting accommodations and transient protection for the magazines or cassettes required for one of any type configuration. Approximate size of the transit case would be 3' x 3' x 5'. These units must be waterproof of sturdy construction and must be insulated to maintain temperature over extended periods.

The transit case will accommodate the following complements:

##### For Configuration A-1

3 Magazines Model HM-730  
1 Magazine Model HM-731

##### For Configuration A-2

3 Magazines Model HM-731

##### For Configuration B

2 Cassettes Model 73-B

##### For Configuration C

2 Cassettes Model 73-C

##### Specification

The transit case will comprise three major components, the base, the rack or internal structure, and the cover. The equipment will be of sturdy aluminum construction, corrosion proofed and suitable for air transportation. The transit case will be transported on a standard flat bed dolly. (See Section 5.5.3.)

The base will be of frame type construction providing lifting hooks from which the case may be handled by crane. The base, in conjunction

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### GROUND SUPPORT EQUIPMENT

#### 5.2.2 Loaded Magazine and Cassette Transit Case

##### Specification (Cont'd.)

with the cover will form a vapor and thermo barrier therefore, will be adequately insulated. The base will provide positive fastening features for the rack.

The rack will mount the magazine or cassette complements as described in the requirements of this document. To this end, the structure will be suitable to accommodate the variations of transported combinations as required with no loose adapters. The magazines or cassettes will be fastened to the rack structure by quick-operate devices. The rack will be capable of supporting at 10 G acceleration, any one of the load combinations. The rack will permit access for removing cassettes by crane hoist.

The cover will form a sealed watertight protection for the contents of the case. It shall be proofed against wind-borne rain and dust attacks at any angle. The cover will be sufficiently strong to withstand the impact and stresses of cargo handling. For stack storage purposes the cover will be required to nest into the base of an adjoining transit case assembly. The cover will support the weight of a loaded case assembly at 4 G downward and 2 G side acceleration. The inside of the cover will be insulated and vapor barriered and a minimum clearance of 1-1/2" will be maintained between the cover and its contents. Provisions will be made within the cover for supporting a desiccant agent and humidity indicator cards. A window will be provided in the cover side for viewing the indicator cards. The cover will provide external handles for manual lifting. The cover will be adequately vented for pressure changes.

##### Design Approach

Presently under consideration

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**GROUND SUPPORT EQUIPMENT**

**5.3 Development and Treatment of Sample Data**

**5.3.1 Darkroom and Processing Equipment**

**5.3.1.1 Roll Film Processer.**

Deferred pending results of test site operation

**5.3.1.2 General Darkroom Equipment.**

The equipment required for this purpose is listed on purchase parts list 735601.

**5.3.2 Evaluation Equipment**

**5.3.2.1 70 mm Viewer.**

Specification in preparation. Subject of separate proposal.

**5.3.2.2 Autocollimator.**

To be supplied by optics manufacturer.

**5.3.2.3 General Purpose Evaluation Equipment.**

The general purpose evaluation equipment required for each photo service shop is listed on purchase parts list 735602.



PURCHASE PARTS LIST

General Bartlett's Processing Equipment  
 Part Item #55

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735601

| PART NO. | DESCRIPTION                | MFR. OR SPEC. | TYPE NO. | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|----------------------------|---------------|----------|---------------|-------------|-----------------|-------|
| 030      | Plastic Water Filter       | 30 MFL. SIZE  |          |               |             |                 |       |
| 031      | Identify Tablets (21 step) | Kodak #3      |          |               |             |                 |       |
| 032      | Sclerol 101 blade          |               |          |               |             |                 |       |
| 033      |                            |               |          |               |             |                 |       |
| 034      | Thermometer, Dial Type     |               |          |               |             |                 |       |
| 035      | 500-Dram Holed             |               |          |               |             |                 |       |
| 036      |                            |               |          |               |             |                 |       |
| 037      |                            |               |          |               |             |                 |       |
| 038      |                            |               |          |               |             |                 |       |

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PURCHASE PARTS LIST General Purpose Evaluation Equipment  
End Item #5

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735602

| PART NO. | DESCRIPTION                    | MTN. OR SPEC.        | TYPE NO. | QTY. PER UNIT | MFG. SPARES | TOTAL FOR UNITS | NOTES |
|----------|--------------------------------|----------------------|----------|---------------|-------------|-----------------|-------|
| 01       | Table, Plotting, Film Negative | AP                   | A-2N-2   |               |             |                 |       |
| 02       | Microscope, Adj. Arm & Stand   | Spence (Armer, Opt.) | #23-LF   |               |             |                 |       |
| 03       |                                |                      |          |               |             |                 |       |
| 04       | Stereo Viewer                  | Old Delpat           |          |               |             |                 |       |
| 05       | Sensitometer                   |                      |          |               |             |                 |       |
| 06       |                                |                      |          |               |             |                 |       |
| 07       |                                |                      |          |               |             |                 |       |
| 08       |                                |                      |          |               |             |                 |       |
| 09       |                                |                      |          |               |             |                 |       |
| 10       |                                |                      |          |               |             |                 |       |
| 11       |                                |                      |          |               |             |                 |       |
| 12       |                                |                      |          |               |             |                 |       |
| 13       |                                |                      |          |               |             |                 |       |
| 14       |                                |                      |          |               |             |                 |       |
| 15       |                                |                      |          |               |             |                 |       |
| 016      |                                |                      |          |               |             |                 |       |
| 017      |                                |                      |          |               |             |                 |       |
| 018      |                                |                      |          |               |             |                 |       |

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**5.4 Storage Racks and Cabinets for Shop**

The general equipment required for each service shop is listed on purchase parts list 735626.



## PURCHASE PARTS LIST

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735626

End Item #86 (Partial List)

| PART NO. | DESCRIPTION                          | MFR. OR SPEC. | TYPE NO.   | QTY. PER UNIT | MFR. SPARES | TOTAL FOR UNITS | NOTES |
|----------|--------------------------------------|---------------|------------|---------------|-------------|-----------------|-------|
| 01       | Work Bench 72" x 24"                 | Lyon          | 2537       | (3)           |             |                 |       |
| 02       | Filing Cabinet (4 drawers)           | Lyon          | 1101       |               |             |                 |       |
| 03       | Stools                               |               |            |               |             |                 |       |
| 04       | Storage Rack (open type)             | Lyon          | 4044       | 3             |             |                 |       |
| 05       | Storage Rack (End Sect.)             | Lyon          | 4536       | 3             |             |                 |       |
| 06       | Hardware Storage Cab. Plastic Drawer |               | Model J-24 |               |             |                 |       |
| 07       | Bread Pane 14 size                   |               |            |               |             |                 |       |
| 08       | Muffin Tins 8 hole                   |               |            |               |             |                 |       |
| 09       |                                      |               |            |               |             |                 |       |
| 10       |                                      |               |            |               |             |                 |       |
| 11       |                                      |               |            |               |             |                 |       |
| 12       |                                      |               |            |               |             |                 |       |
| 13       |                                      |               |            |               |             |                 |       |
| 14       |                                      |               |            |               |             |                 |       |
| 15       |                                      |               |            |               |             |                 |       |
| 16       |                                      |               |            |               |             |                 |       |
| 017      |                                      |               |            |               |             |                 |       |
| 018      |                                      |               |            |               |             |                 |       |
| 019      |                                      |               |            |               |             |                 |       |

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### GROUND SUPPORT EQUIPMENT

#### 5.5 Configuration Installation and Preflight Checkout Equipment

##### 5.5.1 Preflight Checkout Facilities

###### Requirement

To provide complete monitored operational checkout of configuration, or components thereof at the flightline position, it is required that a preflight test stand design be provided. The test stand would form a part of field operations and will be used by the photo service team as a facility for performing mechanical inspection and electrical tests as required by the Configuration Pre-Flight Check List. The test stand will be approximately 24" wide, 34" high and 36" long.

Basic requirements of the test stand will include the following features:

- a. Lightweight construction
- b. Complete transportability
- c. Storage compartments and drawers
- d. 115 volt 60 cycle service panel.

###### Specification

The preflight test stand will operate in conjunction with either aircraft power or power supplied by the Battery and Vacuum Cart (See Section 5.111). The stand will provide the facilities necessary to perform final or confidence operational testing of the configuration, prior to or after installation in the aircraft.

The stand will be of aluminum frame and will provide fold-up features to form its own transit case. Drawers and storage compartments will be provided in the test stand. As transporting facilities, the test stand will have lift hooks for overhead hoisting and it will be possible to lift the stand by fork lift.

The stand will have mounted as a permanent part, a plug-in panel for 115 volt 60 cycle power output and will be wired for the same power input.

A standard ground support equipment nameplate will be provided with stamped part number.

Finish protection will be suitable for all weather type operation.



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### GROUND SUPPORT EQUIPMENT

#### 5.5.1 Preflight Checkout Facilities

##### Design Approach

The test stand basically will be of aluminum frame construction with 1/4" plywood enclosing the sides. The top surface will be 1/4" tempered masonite.

The stand will be rigid and sufficiently strong to support a Photo Servicemans tool chest resting on the top surface. Two 3" drawers will be located under the top surface for specialized small hand tools. Four compartments will be provided for storage of an Event Recorder, Oscillograph Recorder, portable vacuum system and collimating equipment. Fastening means, as necessary, of quick operate type will be provided in each compartment for lashing down contents during transport. A plywood drop-lid panel with secure locking provisions will be provided to completely package the test stand for transport.

Four standard lift hooks will be located at the lower corners on the end panels. The test stand will be supported by its end structures sufficiently high off the ground to enable fork lifting.

The stand will be wired for 115 volt 60 cycle power input at the end and will provide four outlet plugs, weather protected, in a front panel.

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### GROUND SUPPORT EQUIPMENT

#### Flightline Installation Equipment

The flightline installation and checkout equipment as follows while held to an absolute minimum in size, weight and numbers will provide the photo service team reliable and expedient facilities to the end of maximum assurance of the proper operation of the installed camera equipment:

- Standard Transport Dolly
- Preflight Test Stand
  - Electrical Test Set
  - Tool Box
  - Oscillograph Recorder
  - Event Recorder
- Collimator
- Magazine Transit Case
- Configuration in Shipping Container
- Battery and Vacuum Cart (Optional)
- Shelter (Pending)

Requirements of slings, jigs, alignment blocks, etc. as aids in the installation procedures will be held to an absolute minimum. The current test site operations will determine the facilities required for the projected operational program and studies are presently being made by the camera manufacturer toward this end.

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### GROUND SUPPORT EQUIPMENT

#### 5.5.3 Standard Transport Dolly

##### Requirement

For the purposes of enabling transport handling of configuration, their containers and shipping facilities, and the loaded film magazine and cassette transport cases there is required transport dollies.

General requirements for the dollies will provide for the following features:

- a. Light weight and durable.
- b. Easily guided and moved by hand power.
- c. Capable of being towed by small vehicle, (jeep).
- d. Capable of operation over steel matting.
- e. Tie down hooks for airlift operations.
- f. Length and width sufficient to accommodate ground support shipping cases.

##### Specification

The equipment described above will be of aluminum material rigid construction. will have a flat bed 36" wide by 72" long not more than 15" from the ground level. The bed will be sufficiently rugged to prevent serious denting or sagging from the effects of loading and unloading heavy metal cases. Wheels will be 10" in diameter, will incorporate standard good quality semi-pneumatic tires, and sealed and permanently lubricated antifriction bearings. Two wheels at the rear will be directionally fixed. Two wheels at the front will be steerable, individual by castoring. It will be possible to tow this equipment at 10 mph over dry graded dirt roadway loaded with 1500# of equipment without damage to the truck, and without shimmying of castored wheels. Clearance under the truck will be sufficient at all points to permit it to pass over a 4" high obstacle on a plane surface. The tread of the wheels will be not less than 26" and the wheel base not less than 48". Brakes incorporating two shoes contacting the out-

## AERIAL SURVEYING EQUIPMENT PROJECT PLAN

### GROUND SUPPORT EQUIPMENT

#### 5.5.3 Standard Transport Dolly (Cont'd.)

side of the rear, fixed, tires and operable from the front or towing end of the vehicle by either hand or foot will be installed. These brakes will be used solely for parking, will not be automatic, and will exert enough pressure to hold the loaded truck on a smooth surface inclined 20° from the horizontal. It will be possible to maneuver the truck by hand utilizing a handle which may also be a tow bar. It will be possible to pivot the loaded truck about either rear wheel in either direction. It will be possible to store the truck with its handle up. Corner bumpers will be installed to minimize damage to the truck, its contents and to adjacent equipment from minor collisions. The net weight of the truck will not exceed 200#. AN hardware will be used where ever possible through out. All working parts will be corrosion proof either by virtue of the material used, or proper finishing. The completed truck will be painted in colors to be specified by the camera manufacturer. Lifting rings will be fixed, fore and aft, at the corners for lifting the loaded truck by overhead crane and for down lashing during shipment.

#### Design Approach

Presently under consideration.



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### GROUND SUPPORT EQUIPMENT

#### 5.5.4 Equipment Transport Dolly

Deferred pending shelter design and specifications.

#### 5.5.5 Shelter, Flight Line Installation

Specifications for the shelter are in preparation and will be the subject of a separate proposal.

Installation operations at the test site affect the shelter design and the shelter specifications cannot be completed until the study of the installation procedures at the test site are completed.